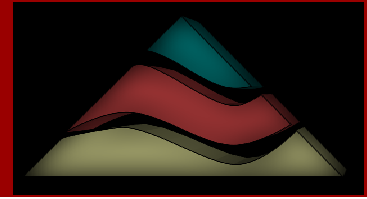


HazMAP

Multi-Jurisdictional Element



Mitigation Strategies for Hydrologic Hazards: Top Ten Priority Actions to the Year 2010

North Central Texas Council of Governments

The North Central Texas Council of Governments (NCTCOG) has conducted the initial 2003-04 planning cycle for Hazard Mitigation Action Planning (HazMAP) for its 16-county region centered by Dallas and Fort Worth. HazMAP is a multi-jurisdictional planning process consistent with the Disaster Mitigation Act of 2000 and the requirements of the Governor's Division of Emergency Management (TxDEM).

NCTCOG has put into place a framework for coordinated and focused hazard mitigation actions at both the local and regional levels. NCTCOG intends to continue to coordinate the overall process within available resources. Local governments in Texas are not required to adopt a Hazard Mitigation Action Plan, but many will choose to do so to be eligible for pre-disaster and post-disaster federal funding for mitigation purposes.

NCTCOG has proposed a *Model Resolution* whereby a local government's Hazard Mitigation Action Plan consists of both local elements that each community prepares and approves, and multi-jurisdictional elements that NCTCOG prepares and approves (with subsequent local government action).

This document is one of the multi-jurisdictional elements prepared by NCTCOG to satisfy the state/federal requirements and assist its member local governments in adopting local hazard mitigation action plans. It provides the multi-jurisdictional blueprint for reducing the potential losses from hydrologic hazards identified in the approved "Multi-Hazard Risk Assessment: Forewarnings of Natural Hazards to the Year 2030," based on existing authorities, policies, programs and resources of NCTCOG, local governments, and partner state/federal agencies, and their ability to expand on and improve these existing tools.

The 2003-2004 HazMAP planning cycle has been supported in part with funding from FEMA, through the Governor's Division of Emergency Management. It has been guided by a HazMAP Review Team of local government representatives. Staffing has been provided by NCTCOG's Department of Environment & Development, with involvement by several other agency departments. The consultant team is headed by Halff Associates, Inc., in association with Michael Baker, Jr., Inc., Rebecca Quinn CFM, and individual team specialists. See <http://www.hazmap.nctcog.org>

This document is organized as follows:

- Why Do We Need to Identify Mitigation Strategies for Hydrologic Hazards?
- What are the Hydrologic Hazards for North Central Texas?
- What are the Goals for Mitigating Hydrologic Hazards?
- What is the Menu of Mitigation Actions?
- What is the Action Plan to the Year 2010 for Mitigating Hydrologic Hazards?
 - Actions to Better Understand the Hydrologic Risks
 - Actions to Stabilize the Hydrologic Risks
 - Actions to Reduce the Hydrologic Risks
 - Actions to Better Understand, Stabilize and Reduce the Hydrologic Risks

Why Do We Need to Identify Mitigation Strategies for Hydrologic Hazards?

Natural hazards in the 16-county North Central Texas region historically have caused significant disasters with losses of life and property and natural resources damage, including six of the top ten costliest weather hazard events in Texas since 1950.

The Federal regulations guiding HazMAP (*44 CFR Part 201.6(c)(3)*) require that the plan have mitigation strategies to address the hazards identified in the risk assessment. A mitigation strategy provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The regulations require that the mitigation strategy shall include:

- a) a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards
- b) a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure
- c) an action plan describing how the actions identified above will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis to the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs

This document provides the multi-jurisdictional blueprint for reducing the potential losses from hydrologic hazards identified in the approved "Multi-Hazard Risk Assessment: Forewarnings of Natural Hazards to the Year 2030," based on existing authorities, policies, programs and resources of NCTCOG, local governments, and partner state/federal agencies, and their ability to expand on and improve these existing tools.

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by and for local governments, established to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development. By state statute, the purpose of a Council of Governments is "to make studies and plans to guide the unified, far-reaching development of a region, eliminate duplication, and promote economy and efficiency in the coordinated development of a region."

What are the Hydrologic Hazards for North Central Texas?

The following are excerpts from the more extensive “Multi-Hazard Risk Assessment: Forewarnings of Natural Hazards to the Year 2030” approved by NCTCOG’s Executive Board in January 2004: http://www.hazmap.nctcog.org/risk_assessment/Chapter1.asp, chapters 18-21. The hydrologic hazards include flooding, stream bank erosion, dam and levee failures.

Flooding

Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. The statistical meaning of terms like “25-year storm” and “100-year flood” can be confusing. Simply stated, a floodplain can be located anywhere; it just depends on how large and how often a flood event occurs. Floodplains are those areas that are subject to inundation from flooding. Floods and the floodplains associated with them are often described in terms of the percent chance of a flood event happening in any given year. As a community management or planning term, “floodplain” most often refers to an area that is subject to inundation by a flood that has a one percent chance of occurring in any given year (commonly and incorrectly referred to as the 100-year floodplain).

According to the Federal Interagency Floodplain Management Task Force, flooding in the United States can be separated into several types: Riverine Flooding, Flash Floods, Local Drainage or High Groundwater Levels.

Stream Bank Erosion

Stream channels are eroded by the energy of flowing water. The two types of stream bank erosion are the surface erosion of channel bank material and mass wasting. Surface erosion is the removal of individual soil particles due to the tractive force of water. Mass wasting is defined as a structural failure of a section of the stream bank, which can be caused by undercutting due to surface erosion.

Surface erosion occurs when the energy of the water exceeds the shear strength of the soil and particles are removed. The strength of the tractive force of water increases proportionally to the velocity and depth of flow. There are many factors which affect the ability of water to erode. Larger size particles weigh more and are more resistant to the force of water; for example, gravel size particles are more resistant than sand sized particles. Cohesive soils such as clays are more resistant to particle removal than soils consisting of non-cohesive silt-sized materials. Inclusions of silt or other non-cohesive particles can also make clayey soil layers more susceptible to erosion. Another factor affecting erodibility is soil cover. Vegetative cover reduces the velocity of water and tractive force on soil particles compared to bare soil conditions. Different types of vegetation as well as their location on the stream bank provide varying amounts of resistance to soil particle removal.

There are several phenomena that cause the surface erosion of stream banks. Flow hydraulics, rainfall, groundwater seepage, overbank drainage, wave attack, freeze-thaw and wet-dry cycles, and land use all have an effect, both individually and in concert. The purpose of this analysis is to identify areas in which mitigation activities may be needed in the coming years. Therefore, instead of detailed descriptions of each of these causes, this assessment focuses on the identification of potential hazard areas based on existing and available digital data. In addition,

this assessment provides guidance for compiling additional data for extended analysis in future planning cycles.

Natural channels of all types are constantly changing. However, most eventually reach a point of relative stability or equilibrium. Development of the contributing watershed of a stream often results in increased impervious area, reduced infiltration, increased runoff, increased flood peaks and sometimes velocity, and increased flood frequencies. These subsequent higher peak flows and velocities impart a greater tractive force on the stream bank, which results in higher erosion rates than the pre-development state of relative equilibrium. It is a generally accepted rule of thumb that development of a watershed will cause a stream to roughly double its channel area. This process occurs over a long period of time, and many geomorphologists think it may take from 50 to 100 years for a channel to reach this new state of stability (Halff 1998). The subsequent erosion can endanger nearby structures, cause massive failures of large areas of bank material, and increase the silt load of the stream.

Dam and Levee Failures

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. Because dams are man-made structures, dam failures are usually considered technological hazards. However, since most dam failures result from prolonged periods of rainfall, they are often cited as secondary or cascading effects of natural flooding disasters and are not named as the primary hazard that causes disaster declarations.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures inadequate spillway capacity, resulting in excess overtopping flows
- internal erosion caused by embankment or foundation leakage or piping
- improper design
- improper maintenance
- negligent operation
- failure of upstream dams on the same waterway

Levees are earthen embankments whose primary purpose is to furnish flood protection from seasonal high water for a few days or weeks a year. Levees are broadly classified as either urban or agricultural because of the different requirements for each. Urban levees provide protection from flooding in communities, including their industrial, commercial, and residential facilities. Agricultural levees provide protection from flooding in lands used for agricultural purposes.

Levee failures occur throughout the United States, most commonly near river basins. When levees fail, surrounding areas are subject to flooding, which can cause substantial, often devastating damage to homes, structures, and agricultural areas. Levee failures have caused a great number of livestock deaths and human casualties

Continuing growth and development in the region has resulted in increasing storm water and drainage issues, challenging communities to further stabilize flood risks and minimize future flood losses.

What are the Goals for Mitigating Hydrologic Hazards?

The Federal regulations require that the mitigation strategy include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards

In June 2002, NCTCOG's Executive Board adopted a strategic plan to *SEE Safe Clean & Green Regional Environmental Corridors* (<http://www.dfwenvironment.com>). The vision of success is that the values of the successful Trinity River COMMON VISION program are adopted in the Trinity watersheds, with more than 100 additional communities joining with the 14 entities who chartered the original program in 1990. And that as a result, all regional corridors be SAFE, CLEAN & GREEN by the year 2025.



There are more than 2,400 miles of regional environmental corridors in North Central Texas. This initiative strives to help the region achieve the vision of SAFE CLEAN & GREEN corridors, including Ten Mile Creek in the City of DeSoto (above).

This vision is further defined as:

- **SAFE** regional environmental corridors occur where the risks of loss of life and property damage from flooding are reduced, the natural function of the floodplain to safely convey storm water is preserved, and the financial integrity of the region's residents is secured.
- **CLEAN** regional environmental corridors support water quality that meets or exceeds the State's aquatic and wildlife protection, wastewater disposal needs, and sustains aesthetically attractive surface water conditions.
- **GREEN** regional environmental corridors are ribbons of greenways that tie together diverse ecological areas, open spaces, recreational and mobility opportunities throughout the region.

For purposes of the Hazard Mitigation Action Planning Process (HazMAP), three specific hydrologic mitigation goals have been enumerated:

Hydrologic Mitigation Goals

- **Better understand the hydrologic risks within the corridors**
- **Stabilize the hydrologic risks**
- **Reduce the hydrologic risks**

As presented later in this document, the recommended actions in the action plan are consistent and fall within these three hydrologic mitigation goals,

What is the Menu of Mitigation Actions?

The Federal regulations require that the mitigation strategy include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard. The mitigation strategy is to be based on "existing authorities, policies, programs and resources" and an agency's "ability to expand on and improve these existing tools."

As discussed in the document "Multi-Jurisdictional Hazard Mitigation Action Planning Process, 2003-2004 Planning Cycle," HazMAP is building on a strong foundation that already exists. NCTCOG and its member local governments and partners have been engaged in various elements of "HazMAP" for many years – we just haven't called it that.

NCTCOG has nationally recognized programs in floodplain & Multiple Objective Management (MOM) through the Trinity River COMMON VISION with the U.S. Army Corps of Engineers (USACE) (<http://www.nctcog.org/envir/trin/index.html>), sponsors local training programs and has produced a floodplain management video with FEMA (<http://www.nctcog.org/envir/Videos/realvideo.html>), has coordinated building and construction codes for more than 35 years (<http://www.dfwcodes.com/>), developed the hazardous materials routing system for the region more than a decade ago, last year adopted a vision & strategic plan for Safe Clean & Green regional environmental corridors (<http://www.nctcog.org/envir/trin/index.html>), and has recently launched a Center of

Development Excellence to recognize sustainable development practices (<http://www.developmentexcellence.com>).

NCTCOG's "menu of mitigation actions" encompasses a wide range of programs that serve to identify and analyze "a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of hydrologic hazards." Two of the most important and creative are discussed below.

Using Benefit-Cost Results from Upper Trinity River Feasibility Study

The ground-breaking *Upper Trinity River Feasibility Study* is described in more detail later in this document (see "Action 10 – Trinity River COMMON VISION/UTRFS"). It is an unprecedented partnership among NCTCOG, fourteen local governments, and state/federal partners, especially the U.S. Army Corps of Engineers (USACE), to implement the Trinity River COMMON VISION. NCTCOG serves as the Local Sponsor under interagency agreements with the participating local governments and the USACE.

Phase I of the UTRFS was completed in the mid-1990's with the preparation and issuance of an important document entitled "Information Paper: A Benefit-Cost Analysis." It presented the results of feasibility level investigations performed by the USACE, in cooperation with NCTCOG and participating local governments, to identify water and related land resource needs within the Upper Trinity River Basin under the authority of a Senate Resolution adopted in 1988.

The specific purpose of the Information paper was to perform benefit-cost analyses on more than 100 potential implementation actions within the Upper Trinity River Basin, ranging from structural flood control measures to environmental restoration projects. The details with costs for each measure investigated are presented, along with the implementing entity. For each measure, the detailed analysis included first cost, benefits, and benefit-cost ratio.

Phase II of the UTRFS, still going strong, required interested implementing entities to cost-share 50-50 with the federal government in more detailed formulation studies to identify potential construction projects and federal interest to assist with implementation. Even in the first few years, some astounding billion-dollar projects have emerged for the two largest cities along the corridor:

- **Fort Worth Trinity River Vision** (<http://www.trinityrivervision.org/>): The Vision that has emerged from the Trinity River Vision Master Plan is to preserve and enhance the river corridors so that they remain as essential greenways for open space, trails, neighborhood focal points, wildlife, and special recreation areas. These riparian corridors are critical elements in preserving environmental quality and a high quality of life that attracts people to locate and stay in Fort Worth. Downtown waterfront initiatives (over former brownfields) will help accomplish a renaissance of the greater Downtown area that result in a sustainable mix of people living, working, playing, and learning in the Central City area. The master plan calls for a new downtown urban lake, bypass channel, and removal of the existing levees. The total local/state/federal costs could approach a billion dollars.
- **Dallas Trinity River Corridor Project** (<http://www.trinityrivercorridor.org/>): The Trinity River Corridor Project is made up of several distinct elements. The overall effort will include:

- The building of levees, wetlands, a downtown lake, gateway parks, trails, equestrian centers, and an interpretive center.
- The expansion and preservation of the Great Trinity Forest through the acquisition of 2,700 acres of land along the Trinity River.
- Transportation improvements including the Trinity Parkway and the Woodall Rodgers Extension Bridge.

In May 2004, the Dallas City Council endorsed a “Locally Preferred Plan” for the Dallas Floodway improvements as part of the overall master plan. The City of Dallas is using funds from the \$246 million bond program, approved by voters in May 1998. State, federal and other agencies are providing additional funds totaling approximately \$1 billion.

Combining FEMA’s Standard Six Broad Categories of Mitigation Measures with CRS

NCTCOG is using and has expanded upon FEMA’s standard categories of mitigation measures as part of the HazMAP:

- Prevention measures
- Property protection measures
- Public education & awareness
- Natural resource protection
- Emergency services
- Structural projects

With consultant assistance, NCTCOG has for the first time (anywhere?) matched these categories with each of the specific elements of the Community Rating System (CRS), and then has expanded on the CRS description with real-life examples from North Central Texas. The details can be found at the HazMAP website (<http://www.hazmap.nctcog.org>), and will aid NCTCOG as it encourages and helps more cities become active CRS participants (see “Action 8 - CRS 30” later in this document).

For example, “prevention measures” include CRS measures 310, 320, 330, 340, 360, 410, 420, 430, 430LD, 440, 450, and 540 (*as explained in detail at NCTCOG’s website*). CRS Activity 320 is Map Information, and FEMA allows a maximum of 140 CRS points for certain map information activities if provided by communities or other qualified agency (such as NCTCOG). One example that is cited is the City of Garland, which provides a “Floodplain Determination” service to the public and has a Flood Determination phone number listing in the Greater Dallas Business White Pages.

As part of “Action 8 - CRS 30” (later in this document), NCTCOG intends to continue to seek viable examples and to assist its members to maximize its rating and thus minimize the premiums paid by flood insurance owners. Pursuit of CRS also directly satisfies FEMA’s stated desires to have agencies consider mitigation actions “with particular emphasis on new and existing buildings and infrastructure.”

What is the Action Plan to the Year 2010 for Mitigating Hydrologic Hazards?

Introduction

The Federal regulations require that the mitigation strategy include an action plan describing how the actions will be prioritized, implemented, and administered by the local jurisdiction. NCTCOG has relied on a wide range of sources and activities to identify assess and prioritize mitigation actions for hydrologic hazards in this multi-jurisdictional strategy, including but not limited to:

- Experience and assessments by the planning team of NCTCOG staff and nationally-recognized consultants
- Guidance from the HazMAP Review Team, made up of a cross-section of local government representatives
- Discussion and input by various NCTCOG advisory boards, such as the Floodplain Administrators Roundtable and Trinity River Executive Committee
- Concerns and suggestions from member local governments through a written survey, participation at public meetings, and one-on-one conversations
- Comments from the public at large via the internet, public meetings and public hearings
- Discussion and actions by NCTCOG's Executive Board of elected officials in approving the multi-jurisdictional elements

10 by 2010 Action Plan

NCTCOG has developed a top ten list of mitigation actions to be carried out over the next five years. It is being called "10 by 2010 Action Plan." It details cooperative actions to meet the hydrologic mitigation goals – better understand, stabilize and reduce the hydrologic risks. One action is not more or less important than another ... all ten work together to meet our goals.

Top Ten Actions to Better Understand, Stabilize & Reduce Hydrologic Hazards (not in any order ... need all ten)

Actions to better understand the hydrologic risks

1. **Prevent a Disaster ... Live Happily Ever After ...** provide coordinated regionwide training and expanded public outreach on flooding/hydrologic risks
2. **HazMAP ...** facilitate the development, maintenance and implementation of community hazard mitigation action plans across the region
3. **TRIN ...** improve decision-making tools for mapping and modeling hydrologic hazards through a coordinated Trinity River Information Network

Actions to stabilize the hydrologic risks

4. **Non-NFIP > NFIP > NFIP Plus ...** increase community and citizen participation in the National Flood Insurance Program
5. **CDC ...** continue the Corridor development certificate process along the primary corridors, and expand the CDC criteria into watersheds where merited

6. **Failure is Not an Option** ... protect existing dams and levees with regular safety assessments and ongoing maintenance

Actions to reduce the hydrologic risks

7. **No RLF** ...eliminate or elevate repetitive loss properties through a cooperative “No RLP” regional initiative
8. **CRS 30** ...increase active participation in the Community Rating System to at least 30 communities
9. **iSWM** ... implement “integrated Storm Water Management” for construction and new development/redevelopment

Actions to better understand, stabilize & reduce the risks

10. **Trinity River COMMON VISION/UTRFS** ... undertake a variety of 50/50 local/federal cost share projects towards meeting the safe, clean & green goals

On the following pages, each mitigation action is described using a similar format:

- Short title and description of the action
- Target by Year 2010; what are we trying to accomplish over the next five years?
- A more detailed description of the action in several paragraphs
- Responsibility to carry out the action
- Anticipated sources of funding
- Timing through the Year 2010
- Beneficiary

The previous section has described how the prioritization process of mitigation actions has included an emphasis on the use of benefit-cost review for potential projects, through the *Upper Trinity River Feasibility Study*, to maximize benefits.

Actions to Better Understand the Hydrologic Risks

Mitigation actions discussed in this section to better understand the hydrologic risks include:

- **Prevent a Disaster ... Live Happily Ever After** ... provide coordinated regionwide training and expanded public outreach on flooding/hydrologic risks
- **HazMAP** ... facilitate the development, maintenance and implementation of community hazard mitigation action plans across the region
- **TRIN** ... improve decision-making tools for mapping and modeling hydrologic hazards through a coordinated Trinity River Information Network

Action 1. “Prevent a Disaster ... Live Happily Ever After” ... provide coordinated regionwide training and expanded public outreach on flooding/hydrologic risks

Target by Year 2010: Better educated local staffs, elected officials & citizenry on hydrologic risks ... maximum number of community staff as CFM's and CRM's ... building on the regionwide theme of *Prevent a Disaster ... Live Happily Ever After*

Floodplains are lands bordering rivers and streams that normally are dry but are covered with water during floods. The overall condition of a floodplain determines the pattern of water flow and potential for flooding as storm water drains from any given area. Physical encroachment into a floodplain can change the flood damage potential of an area by altering the flow of water or by changing the width, depth, and/or velocity of floodwaters.

Floodplains have other important functions besides drainage. Improving water quality providing natural habitat, offering recreational opportunities, and enhancing general quality of life are just some of the comprehensive functions that a floodplain can provide. Once any natural function has been impaired, it is very costly and difficult to restore or repair that floodplain's natural function.

The NCTCOG has established the following programs and activities that support the goals of this mitigation action and provide a **better understanding of the hydrologic hazards:**

- HazMAP public outreach program: *Prevent a Disaster ... Live Happily Ever After*
- Web-based programs include: Safe, Clean and Green; Trinity Common Vision and the CDC process; HAZMAP; Mobilization 2030; and iSWM.
- Elected Officials Workshops and Training such as the special elected official workshops conducted at the Texas Floodplain Management Association conference held in Fort Worth, Texas April 27-29, 2004.
- NCTCOG conducts periodic Floodplain Managers Roundtable meetings, inviting floodplain administrators from around the region along with state/federal partners
- Flood Management Task Force meetings as part of the Trinity River COMMON VISION
- NCTCOG sponsored annual FEMA Floodplain Management Shortcourse – *Managing Floodplain Development through the NFIP*

- NCTCOG publication “Reflections on the Trinity” which is regionally distributed and on www.nctcog.org.
- FEMA Flood Forum 2004 held in Grand Prairie, Texas on April 21, 2004 which was conducted by FEMA and the NFIP and hosted by the City of Grand Prairie with NCTCOG support.
- A variety of classes offered through NCTCOG’s Regional Training Center

NCTCOG also is very interested in exploring the potential of online training for local communities and others. One example that will be further researched is the **Online HazMAT School** (<http://www.hazmatschool.com>). **Online Hazmat School** provides **online** hazardous waste, hazardous materials and safety training to fully comply with OSHA and DOT requirements. They provide official OSHA and DOT certificates and continuing education units, CEU's. It is a program of the ABAG Training Center, a joint effort of the Association of Bay Area Governments and ABAG, Inc. The Association is a joint powers government organization of 100 cities and nine counties in the San Francisco Bay Area, which is the COG structure in California.

This mitigation action includes continuing the NCTCOG programs and public awareness activities as listed above, and seeking to expand and enhance them on an annual basis to 2010.

Responsibility: NCTCOG to coordinate regional public awareness, and offer training classes through its Regional Training Center and/or on the web
 FEMA Region VI (support and provision of training)
 USACE (support)
 EPA Region VI (support)

Funding Sources: FEMA
 USACE
 EPA
 NCTCOG communities’ cost-share support and tuition for classes
 Private sector tuition for classes

Timing: Annual work programs with ongoing activities through 2010

Beneficiary: All communities and their citizens

Action 2. “HazMAP” ... facilitate the development, maintenance and implementation of community hazard mitigation action plans across the region

Target by Year 2010: Adopted countywide and individual community Hazard Mitigation Action Plans (HazMAP) and Flood Mitigation Assistance (FMA) plans being implemented across the region, incorporating both local and regional HazMAP elements

This mitigation action involves two phases keyed to the Federal calendar:

Phase 1 – NCTCOG has identified multi-jurisdictional mitigation strategies that are web assessable and complement the *Multi-Hazard Risk Assessment* that has been available on the NCTCOG website since December 2003 to assist countywide and individual community efforts to develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Following NCTCOG Executive Board approval of the multi-jurisdictional HazMAP elements in June, 2004, NCTCOG will survey its members to determine who intends to submit a plan by November 2004, and will offer mini-workshops (within available resources) to assist those communities in this regard.

Phase 2 – NCTCOG intends to provide technical support to communities to develop and adopt HAZMAP plans and FMA plans and provide technical support for annual plan reviews beyond 2004, within available resources. NCTCOG will continue to work with other multi-jurisdictional partners with responsibilities for specific hazards. This is further detailed in the document *“Multi-Jurisdictional Hazard Mitigation Action Planning Process to the Year 2010.”*

Responsibility: NCTCOG (lead for overall multi-jurisdictional planning and selected hazards)
Other multi-jurisdictional agencies with responsibilities for selected hazards(e.g., State of Texas for air quality state implementation planning)
All NCTCOG communities for local plans

Funding Sources: Governor’s Division of Emergency Management (as available)
TWDB – FMA annual funding for planning
FEMA

Timing: Phase 1 - Plan Adoption for all communities that plan on meeting the initial DMA 2000– November 1, 2004 deadline
Phase 2 - Plan adoption for remaining communities that prepare HAZMAP after the initial November 1, 2004 deadline and to provide technical assistance for annual plan reviews (annually to 2010); provide technical assistance for communities that prepare FMA Plans (annually to 2010)

Beneficiary: All participating communities and their citizens

Action 3. “TRIN” ... improve decision-making tools for mapping and modeling hydrologic hazards through a coordinated Trinity River Information Network

Target by Year 2010: Evolve into a fully-functioning, web-based Trinity River Information Network (TRIN) that seamlessly incorporates USACE, FEMA and other local/state/federal hydrologic mapping and modeling

In 1989, local governments along the Trinity River have participated in a regional initiative that has stimulated excitement and galvanized support for a new [Trinity River COMMON VISION](#). The intergovernmental participation to pursue this vision has been very successful and is now well into its 15th year. This COMMON VISION is rooted in the better understanding the river and

its importance to the region. The commitment to staying on the “cutting edge” of technology with sophisticated computer modeling and mapping technologies continues to be a main factor behind the success of this nationally recognized program. Mapping and modeling data have been shared between many local, state, and federal agencies over the years. Cooperative efforts to develop new information resources have also been very successful. These successes are important to take advantage of and build on into the future. This understanding lies at the heart of the Trinity River Information Network or “TRIN” for short.

In addition to the data developed so far, TRIN will both benefit and benefit a variety of other current regional programs. Initiatives such as the Cooperative Purchase program for Ortho-imagery and topography across the region will be incorporated to build on existing data and add value to a tool that will be used by all of North Central Texas. It will also be important to pursue new relationships to maximize the value of this data. One example of these new relationships is the Cooperative Technical Partner relationship currently being formed between FEMA Region VI and NCTCOG.

This cooperative mitigation action has a number of near-term objectives, building upon NCTCOG’s state-of-the-art regional Geographic Information System, and opportunities to partner with the USACE and FEMA for improved H&H modeling:

- NCTCOG to continue ongoing cooperative digital orthophoto & LIDAR initiatives, with new aerial flyovers at least every two years. As funding permits, increase the accuracy and utility of the LIDAR product for engineering level studies, and extend coverage to the entire 16 counties
- NCTCOG to pursue identification components of an overall GIS model and develop various layers to be incorporated and maintained as part of TRIN (work program of Upper Trinity study with USACE). Coordinate closely with the FEMA National Service Provider (NSP) to insure compatibility with the GIS data structure in the national management Information Portal (MIP) and Mapping on demand (MOD) project currently under development. Clarify with FEMA future roles in the area of FEMA map maintenance and availability for the NCTCOG region.
- USACE to update existing and CDC hydraulic model for Upper Trinity River Basin and convert current models to HEC-RAS. Coordinate this USEAC activity with FEMA’s Multi-hazard Flood Map Modernization Program (MHFMMP) initiative in the counties that are affected, to avoid duplication of effort and assure compatible mapping products.
- NCTCOG to seek additional participation in scoping of future cooperative mapping and imaging programs. In its potential CTP role, NCTCOG could assist FEMA and the affected counties in assuring comprehensive and practical scoping of FEMA MHFMMP flood insurance restudies and re-mapping projects. This assistance could be in the form of GIS mapping tasks, data collection, and outreach/coordination (e.g., hosting scoping meetings).
- NCTCOG to evaluate potential expansion of modeling information for key Trinity watersheds. Undertake a step-by-step process to consider extending CDC-driven hydrology and hydraulics for use in floodplain permitting for streams outside the primary corridors, including a review of the current criteria and local community ownership of the concept.
- USACE to provide data layer(s) with lands designated or potential as mitigation or ecosystem restoration. This database will provide a more quantifiable measure of the actual implementation of permitted areas and serve as an incentive to communities and the development interests to complete all mitigation features, as permitted. This will

need to include physical features, such as constructed wetlands, as well as designated deed-restricted areas.

- NCTCOG to provide data layer(s) with existing, planned & programmed linear recreation facilities (work program of Upper Trinity study with USACE)
- NCTCOG to pursue being a Cooperative Technical Partner with FEMA for flood insurance studies and other multi-hazard priorities. By serving as a regional CTP with FEMA, NCTCOG could assist in the outreach, education and coordination efforts sought by FEMA in the MHFMMP program. In addition, NCTCOG's technical acumen in the areas of regional data collection, GIS mapping, and coordination of hydrologic and hydraulic studies could be utilized to enhance the FEMA re-mapping efforts in the region. As the facilitator for many key regional flood damage reduction efforts ... especially USACE planning and design, the CDC process, iSWM and HazMAP ... NCTCOG's role as a CTP would be a natural fit.

Responsibility: NCTCOG as Local Sponsor of UTRFS and CTP (anticipated)
USACE as federal partner in UTRFS
FEMA as CTP sponsor
Other agencies with mapping & modeling responsibilities
All NCTCOG communities

Funding Sources: Participating Local Governments
USACE thru UTRFS
FEMA thru CTP

Timing: NCTCOG ongoing regional GIS with cooperative purchase of digital orthos plus related data at least every 2 years; Current Regional Resource Inventory underway as part of Upper Trinity River Feasibility Study, with annual work programs; NCTCOG to seek CTP status and develop cooperative agreements accordingly to assist with the MHFMMP program

Beneficiary: All local, state and federal agencies impacted by Trinity River issues

Actions to Stabilize the Hydrologic Risks

Mitigation actions discussed in this section to stabilize the hydrologic risks include:

- **Non-NFIP > NFIP > NFIP Plus** ... increase community and citizen participation in the National Flood Insurance Program
- **CDC** ... continue the Corridor development certificate process along the primary corridors, and expand the CDC criteria into watersheds where merited
- **Failure is Not an Option** ... protect existing dams and levees with regular safety assessments and ongoing maintenance

Consistent with FEMA goals, these mitigation actions will reduce the effects of hydrologic hazards on existing buildings and infrastructure, and serve to prevent or minimize impacts on new buildings and infrastructure through initiatives such as NFIP “Plus” and the continuation & extension of the CDC process.

Action 4. “Non-NFIP > NFIP > NFIP Plus” ... increase community and citizen participation in the National Flood Insurance Program

Target by Year 2010: Minimize Non-NFIP communities ... maximize NFIP “Plus” communities with “higher standard” flood damage reduction ordinances ... increase policy coverage across the region

Phase 1 – “NON-NFIP > NFIP” - Encourage and assist communities that are not participating in the NFIP to adopt a flood damage prevention ordinance and enroll in the NFIP

FEMA has published Flood Insurance Rate Maps designating Special Flood Hazard Areas (SFHA) throughout the 16 county planning area with the exception of several communities that have been designated by FEMA as a “Non Flood Prone Community.” Currently 178 of the approximately 252 communities in the 16 county planning area participate in the NFIP. Based on NFIP records, of the seventy four (74) NCTCOG communities that do not participate in the NFIP, thirty (30) communities have been mapped by FEMA, have been designated as floodprone communities, and are subject to the sanctions of the Flood Disaster Protection Act of 1973.

The remaining forty four (44) non participating communities have not been identified or mapped as floodprone communities by FEMA. It is likely that many of these nonparticipating communities either have minimal floodprone areas or have no development in designated floodprone areas. Flood insurance is not available in these non participating communities and in the event of a presidential declared disaster, federal financial assistance is not available in areas that have been designated as Special Flood Hazard Areas (Zones A, AE, AH and AO).

State law, HB 1018, requires Texas communities to adopt land use requirements in the form of Flood Damage Prevention Ordinances and enroll in the NFIP. The Texas Commission on Environmental Quality (TCEQ) provides technical assistance to communities to meet the requirements of HB 1018.

This mitigation action includes coordination activities by NCTCOG to schedule and sponsor NFIP Workshops throughout the 16-county planning area to educate communities and citizens regarding the benefits and requirements of the National Flood Insurance Program. The FEMA Flood Forum, held in Grand Prairie, April 21, 2004, is an excellent example of the proposed coordination effort to be directed at the seventy four (74) non participating communities prompting them to reconsider the benefits of the NFIP and adopt the required flood damage prevention ordinance and submit an application to FEMA to enroll in the NFIP. The Texas Commission on Environmental Quality (TCEQ), State Coordinator for the NFIP in Texas, and the Texas Floodplain Management Association (TFMA) can provide assistance to any community that desires to join the NFIP.

Phase 2 – “NFIP > NFIP Plus” - Encourage and assist communities that participate in the NFIP to adopt “higher regulatory standards” to become more disaster resistant and become eligible to enroll in FEMA’s Community Rating System (CRS) Program at a later time.

The CRS Activity 430 identifies specific examples of higher regulatory standards that would assist NCTCOG and interested communities to define “NFIP Plus” for North Central Texas:

- Freeboard requirements
- Protection of floodplain storage capacity
- Building Code Effectiveness Grading (BCEG) classifications from Class 1 to Class 6
- International Code Series when adopted by the community (*Note: NCTCOG advises the region on the International Code Series through its regional Codes Coordinating Committee and its advisory boards*)
- Staffing certifications such as Certified Floodplain managers (CFM) on staff

Responsibility:	NCTCOG (Coordination role) 30 non participating mapped communities regarding NFIP 44 unmapped communities regarding NFIP NFIP communities interested in higher-standard ordinances Texas Commission on Environmental Quality (TCEQ) Texas Floodplain Management Association (TFMA) NFIP Region VI Office (Conduct Workshops) FEMA Region VI
Funding Sources:	FEMA/NFIP Cooperating local communities
Timing:	Define “NFIP Plus” for North Central Texas; Annual work programs to 2010
Beneficiary:	Each community that submits an application and enrolls in the NFIP Property owners in communities that enroll in the NFIP

Action 5. “CDC” ... continue the Corridor Development Certificate process along the primary corridors, and expand the CDC criteria into watersheds where merited

Target by Year 2010: Flood/hydrologic risks have been stabilized along the primary corridors and within key watersheds

The innovative Corridor Development Certificate (CDC) Manual and Process emerged in the early 1990's and forms the cornerstone of the Trinity River COMMON VISION's floodplain management program. The goal of the local government participants in developing and implementing the CDC process has been to stabilize flood risks along the Trinity River Corridor in North Central Texas. The CDC process reaffirms that local government is the authority for local floodplain management decisions. This mitigation action includes continuing the CDC process among its current participants and expanding the process beyond its current Trinity River Corridor geography up into the contributing watersheds in the region.

The CDC Process incorporates future watershed conditions as a consideration in floodplain development decisions. As floodplain development continues, the participating local governments use CDC criteria to ensure that Trinity development in their jurisdiction does not exacerbate flooding. These standards include:

- No increase in the water surface elevation for the 100-year frequency flood
- No decrease in valley storage for the 100-year frequency flood
- No increases in erosive water velocity on-site or off-site
- Equal conveyance reductions on both sides of channels incorporated into hydraulic modeling

To address future potential flood risks as the Upper Trinity River watershed develops, the CDC Process requires that hydrologic modeling be based on future anticipated watershed development (year 2050). While local governments retain ultimate control over their own floodplain development decisions, the CDC Process provides other cities/counties along the Trinity River the opportunity to review and comment on projects throughout the Trinity River Corridor. This peer review process facilitates better floodplain management decisions.

The CDC Process is consistent and complementary with other community floodplain permit requirements. Local governments have had the option of incorporating the CDC criteria into existing permitting strategies for other floodplains throughout their respective communities. The benefits of the CDC include stabilizing flood risk and the development of:

- Common regional criteria
- State-of-the-art floodplain mapping
- Hydrologic modeling based on “future” or “ultimate” Upper Trinity River watershed conditions
- Hydraulic modeling incorporating CDC permitted floodplain development overtime
- U.S. Army Corps of Engineers technical review
- Regional review and comment
- Guarantee of local control of floodplain development decisions

The CDC Manual is currently in its 3rd Edition. It is anticipated that comments and professional discussions may warrant the creation of a 4th Edition in the next few years. Additionally, the

USACE maintains the official CDC Model. It is also anticipated in the next few years that the existing CDC Model (which was originally developed using HEC-2) will be refined using HEC-RAS and will be updated to include permitted projects.

The benefits of extending the CDC process up into significant watersheds of the Trinity Corridor are important. The region's flood risks are not limited to the primary Trinity corridors - many of the tributaries in the Upper Trinity basin have experienced increasing flood damages associated with the increased intensity and complexity of development in the region. Many of the CDC criteria currently being used could be "translated" for use in other areas in the region. Especially important is "valley storage." The upstream and downstream communication that could be a part of the extended CDC program would be an immediate benefit to new participants.

For instance, as new hydrologic and hydraulic modeling information is developed in conjunction with the Big Fossil Creek Watershed Study, a process very similar to the Corridor Development Certificate may emerge as a feasible non-structural alternative for stabilizing flood risks in the watershed. Like the current CDC process in the Trinity River Corridor, a watershed model would be used as a base model to design, analyze and communicate about development decisions.

Responsibility:	NCTCOG (Facilitator role) USACE (Technical resource) Trinity Steering Committee of elected officials from each participating local governments (Policy body) Local communities along the Trinity Corridor
Funding Sources:	USACE, local communities as part of UTRFS Permit Fees from properties going through CDC Possibly partner agencies such as TWDB
Timing:	Permit applications when submitted; annual work programs through 2010
Beneficiary:	Local communities along the Trinity River Corridor and throughout the North Central Texas Region; property owners within the corridors

Action 6. "Failure is Not an Option" ... protect existing dams and levees with regular safety assessments and ongoing maintenance

Target by Year 2010: No dam or levee failures that result in loss of life or significant property damage in the region

The Multi-Hazard Risk Assessment suggests that just because a dam has been in place for 30, 40, 50 years or more does not mean that its continued existence can be taken for granted. Historically, Texas has had more than 50 documented dam failures, with at least two resulting in loss of life.

Each dam in the *National Inventory of Dams* is assigned a downstream hazard classification based on the potential of loss of life and damage to property should the dam fail. The classification has nothing to do with the condition or structure of the dam or whether the dam is about to collapse. Of the close to 7,000 dams in Texas, more than 1,100 are located in the 16 county North Central Texas region.

Of the 168 dams in the region classified as high hazard (where a failure would probably result in loss of life and major damage to property), only 11% have Emergency Action Plans (EAPs) prepared to evaluate and delineate downstream areas that would be inundated by failure of these dams. In other words, 150 of the High-hazard dams in the region do not have Emergency Action Plans. In addition, 250 (almost 23%) of all the dams in the NCT region have not been inspected since 1993.

In addition to the dams listed in the *National Inventory of Dams*, Texas and the region have many more dams that are inventories by the Natural Resources Conservation service (NRCS.) There are more than 650 NRCS dams in the region, and nearly a quarter of them are over 40 years old.

While no record can be found of any previous dam failures in the North Central Texas region, three things are clear: 1) many of the dams in the region are nearing the end of their designated project lives; 2) many of the dams are in desperate need of detailed evaluations; and 3) increased development downstream of these dams has put more people, property and infrastructure at risk.

There are also numerous levees along the primary corridors of the Trinity River, and cooperative studies done by the USACE and NCTCOG show that some are at risk if a Standard Project Flood were to occur today (<http://www.nctcog.org/envir/trin/index.html>). There are major projects underway in Dallas among other communities to address these issues, yet increasing development both upstream and downstream of existing levees are likely to be reducing their current flood protection capabilities.

Since 1917, the State of Texas has had a Texas Dam Safety Program (http://www.tnrcc.state.tx.us/enforcement/dam_safety/history1.html). According to the state's website, "In response to severe under-staffing and lagging resources, the Dam Safety Program presently contracts with the NRCS to perform some of the program's annual dam inspections. Additionally, private dam consulting firms are utilized as necessary to conduct emergency dam safety assessments during emergency events."

The need for action has been recognized by the NRCS, the Texas State Soil and Water Conservation Board, local soil and water conservation districts, and community partners. The Salt Creek and Laterals Watershed program in Wise and Parker Counties is considered a success story and culmination of the local community to address two critical concerns: flooding and sediment deposition. (http://www.nrcs.usda.gov/programs/ws_reinvent/Reinvest/TX/salt_crk.pdf)

The 17 dams installed in the 118,000 acre watershed were approaching the end of their useful life. Some were filling rapidly with sediment. Development upstream and downstream brought new issues, such as increased runoff and the need to upgrade the dams to meet current state dam safety criteria. Through a local/federal partnership, 30 miles of roads and 40 bridges are safer, 270 acres of wetlands have been created or enhanced, and sediment has been greatly

reduced to Eagle Mountain Lake, a water supply to 250,000 people in the Fort Worth metro area.

With many dams in Texas reaching their useful life, the NRCS suggests “an organized approach is needed now to analyze the extent of reinvestment needed, to prioritize those with greatest need, and to make necessary renovations or improvements. The Texas Association of Watershed Sponsors, Texas State Soil and Water Conservation Board, and other state agencies are also in support of this effort.” *Ibid*

One example of a cooperative regional effort through a COG is the “Bay Area Dam Failure Inundation” program operated by the Association of Bay Area Governments (ABAG). It includes web-available inundation mapping, as well as a Hazards Guide. It makes it easy for a citizen to determine if they are in a potential dam inundation area, and to learn about community emergency procedures for the evacuation and control of areas in the event of a dam failure. This degree of attention is because of an actual dam failure in their region.

NCTCOG intends to convene the appropriate public-sector interests to discuss the current situation in North Central Texas, to identify how local governments can help the state and federal agencies satisfy their mandates for regular safety assessments and mapping of inundation areas, and to promote the theme that “*Failure is Not an Option.*”

Responsibility:	NCTCOG (Convener role) NRCS and TCEQ (Technical resources) Local communities, levee districts, dam owners
Funding Sources:	Possibly partnering with NRCS, state agencies
Timing:	Annual work programs to 2010
Beneficiary:	Local communities along the Trinity River Corridor and throughout the North Central Texas region; property owners within the corridors subject to inundation in a dam or levee failure

Actions to Reduce the Hydrologic Risks

Mitigation actions discussed in this section to reduce the hydrologic risks include:

- **No RLF** ...eliminate or elevate repetitive loss properties through a cooperative “No RLP” regional initiative
- **CRS 30** ...increase active participation in the Community Rating System to at least 30 communities
- **iSWM** ... implement “integrated Storm Water Management” for construction and new development/redevelopment

Consistent with FEMA goals, these mitigation actions will reduce the effects of hydrologic hazards on existing buildings and infrastructure, especially through the *No RLF* initiative targeting repetitive loss properties, and serve to prevent or minimize impacts on new buildings and infrastructure through initiatives such as CRS and iSWM.

Action 7. “No RLP” ... eliminate or elevate repetitive loss properties through a cooperative “No RLP” regional initiative

Target by Year 2010: Many of the almost 500 repetitive loss properties in the region have been eliminated or elevated through a cooperative “No RLP” regional initiative with matching federal funds

This action item is to identify and evaluate repetitive loss properties listed in FEMA’s Repetitive Loss database and other properties “at risk” in the 16 county NCTCOG planning area as possible future acquisition and relocation or elevation of structures above the base flood elevation. Based on the April 2004 FEMA Region VI Repetitive Loss Community List, there are approximately 460 Repetitive Loss Properties identified in the 16 county planning area.

A Repetitive Loss Property is a property that has received two or more paid flood insurance claims that exceed \$1,000.00. By utilizing funding available through the Hazard Mitigation Grant Program (HMGP) and Flood Mitigation Assistance (FMA) Program, individual communities can address problems in flood loss and repetitive loss areas by initiating acquisition and structural elevation projects for identified structures and by designing and constructing drainage improvements

NCTCOG would organize cooperative initiatives among interested communities to seek state/federal cost-share funds to eliminate or elevate repetitive loss properties. An example funding source would be Pre-Disaster Mitigation (PDM) funds for which FEMA has established a nationwide competition with RLP the highest priority. A regional cooperative application from North Central Texas would likely fare better than separate (and competing) applications from individual communities in the region. The appropriate institutional structure would be established in NCTCOG to establish criteria and a process such that the “prioritized” properties would be addressed first. Opportunities may also exist as part of the ongoing *Upper Trinity River Feasibility Study* to cost-share for repetitive loss properties. FEMA Region VI has expressed keen interest in property inventory/portfolios, and is working on a pilot program with a neighboring state.

An interesting multi-jurisdictional program that could serve as an example for NCTCOG is the State of Maryland's use of its GIS to identify and map its 311 RLP's throughout the state. A property sheet is created for each RLP with a summary table of flood information, a digital photograph of the structure, a GIS site map in the floodplain, and recommendations for mitigation. The GIS contains an extensive database with this data. A goal of Maryland's project is to create a priority list of properties so that as grant monies become available, structures with the most severe flooding can be mitigated. Our region is equivalent in population and slightly larger than the State of Maryland.

http://www.mde.state.md.us/Programs/waterPrograms/Flood_Hazard_Mitigation/floodMgmtGis/index.asp

Several areas in the NCTCOG planning area may be suitable for future structure elevation projects. Areas designated as shallow flooding areas (Zone AO and Zone AH) on the Flood Insurance Rate Maps are areas with flood depths of three feet or less. There are a significant number of residential structures located in these shallow flooding areas. Federal funds available for HMGP and FMA Projects are administered by the Governor's Division of Emergency Management and Texas Water Development Board. The estimated cost to acquire and relocate a Repetitive Loss Property is \$100,000 per structure and the estimated cost to elevate a residential structure a total of three (3) feet in a shallow flooding area is \$30,000 per structure.

CRS communities are required to conduct annual evaluations of Repetitive Loss Properties located in their communities. Therefore the HAZMAP's for CRS communities will need to be evaluated and possibly updated annually.

Responsibility:	NCTCOG (Facilitator and Applicant roles) NCTCOG CRS Communities Category "C" Repetitive Loss Communities
Funding Sources:	Governor's Division of Emergency Management (HMGP funds) Texas Water Development Board (FMA funds) NFIP – ICC funding for structure demolition (maximum of \$30,000 per structure) Texas Office of Rural and Community Affairs (ORCA) Individual communities (25% local share) Note: Homeowners (willing to settle for 75% settlement); cost based on an estimated 460 properties to be acquired or elevated: \$ 46M to acquire 460 Repetitive Loss Properties with 75% Federal (\$34.5M) and 25% (\$11.5M) local share; \$1.4M estimated demolition cost for 460 structures in 2004 \$
Timing:	FMA annual funding from the TWDB HMGP funding from a local disaster HMGP funding related to a disaster event in Texas PDM funds
Beneficiary:	Region-wide, with particular benefit to communities and owners of repetitive loss properties

Action 8. “CRS 30” ... increase active participation in the Community Rating System to at least 30 communities

Target by Year 2010: Increase from 17 to at least 30 the number of CRS communities in the region ... identify cooperative opportunities among CRS communities to improve ratings & lower property-owner insurance costs

As of May 2004, seventeen (17) of the 42 Texas communities enrolled in FEMA's Community Rating System (CRS) Program are located in the NCTCOG planning area. This is a clear indication of the high level of floodplain management programs that have been adopted by north central Texas communities. FEMA recognizes community efforts that exceed the minimum requirements of the National Flood Insurance Program (NFIP) by designating communities that have adopted “higher standards” as CRS Communities. All flood insurance policies within communities that participate in FEMA's CRS program are rewarded with reduced flood insurance premiums.

A proposed Mitigation Plan Action Item is to encourage additional NCTCOG communities to participate in FEMA's CRS program and assist communities to prepare the CRS Program Application, document CRS activities, prepare annual reports, host CRS workshops and training activities, and develop programs that will result in future CRS credits. The Mitigation Committee recognizes that the CRS Program may not be feasible for communities with minimal staff and for communities with a small number of flood insurance policies in force. Therefore more than 40 NCTCOG communities with 80 or more flood insurance policies in force are excellent candidates for the CRS program (with 17 now actively participating).

The total annual premiums in a community with 80 NFIP flood insurance policies, ranges from \$30,000 to \$50,000 depending on the average policy coverage. Therefore the estimated flood insurance policy savings in a community with a CRS Class 9 rating would be approximately \$7,500 to \$12,500 over a five year certification period or approximately \$1,500 to \$2,500 annually. A Class 8 Rating is 10 percent annual premium savings and Class 7 is 15 percent annual premium savings. The highest CRS ranking in Texas is Class 5 (25% annual premium savings) and the highest CRS ranking in the Nation is Class 3 (35% annual premium savings). The City of Plano is currently a CRS Class 6 Community and several NCTCOG communities are CRS Class 7 and 8. The current number of flood insurance policies in force for each NCTCOG community is listed in Table F-8, NCTCOG Communities NFIP Policies and Claims.

This mitigation action includes CRS Workshops to be coordinated by NCTCOG and conducted by FEMA, ISO and TCEQ. All NCTCOG communities will be encouraged to attend. The NCTCOG could utilize the Floodplain Managers Roundtable and Flood Management Task Force meetings to promote this effort, or provide a new institutional structure. This is a great opportunity for communities that share flood hazards such as the CDC communities to work together and create CRS Program activities that will enhance floodplain management programs and provide the opportunity for adjoining communities to improve CRS classifications.

Technical support can be provided by ASFPM, TFMA, TCEQ, TxDDEM, FEMA and ISO. The NCTCOG could provide technical support for individual communities efforts to prepare CRS Applications, respond to annual compliance reviews and to initiate new CRS activities to

improve CRS ratings. NCTCOG would designate a CRS Coordinator and ensure that he/she attends annual CRS training.

Responsibility:	NCTCOG (Coordinator) Approximately 40 NCTCOG communities as candidates, with a target of at least 30 as active CRS participants by 2010
Funding Sources:	FEMA TCEQ (annual flood insurance policy fees) Participating local communities (cost-sharing, tuition for training, etc.)
Timing:	Annual work programs to 2010; periodic community CRS applications Annual CRS Workshops
Beneficiary:	All NFIP policy holders in CRS communities

Action 9. “iSWM” ... implement “integrated Storm Water Management” for construction and new development/redevelopment

Target by Year 2010: integrated Storm water Management (iSWM) for construction and new development/redevelopment is being implemented by communities across the region

Traditionally, storm water has been managed almost exclusively on a quantity basis—in many cases only controlling the 100-year frequency storm on-site with little concern about the quality of the runoff or impacts of the increased flow downstream. This may be sufficient in a world of concrete-lined channels and extensive underground storm water conveyance systems. However, due to the degraded quality of our streams, rivers, and lakes; the scarcity of natural features as community amenities; and the loss of aquatic and wildlife habitats, both the general public and the regulatory community agree that this is no longer acceptable.

Development and redevelopment, by their nature, increase the amount of impervious land. Many studies have shown that this increased imperviousness is a primary culprit behind the storm water issues we face because it directly translates into loss of natural areas, more sources for pollution in storm water runoff, and ultimately more runoff, which heightens flooding risks. Unprecedented growth and new development in North Central Texas, along with existing infrastructure that is aging and often inadequate, has intensified problems. These issues are further complicated by the fact that storm water does not respect city limits and region-wide variation in local drainage practices actually hinders effective multi-jurisdictional management.

In the most basic of terms, *integrated* Storm Water Management (iSWM) is a new way of managing storm water in North Central Texas. iSWM looks to mitigate the negative impacts of development by *integrating* the management of the quality of storm water with quantity management, as well as *integrating* storm water considerations into the earliest stages of the development and site planning process. iSWM is the avenue to provide comprehensive and practical guidance oriented to implementation in everyday practice.

This proposal centers on the continued development and implementation of comprehensive guidance in the *integrated* management of storm water quantity and quality throughout the planning, design, construction, operation, and maintenance of storm water infrastructure.

The iSWM initiative is producing three pieces of guidance for implementation during 2004-05.

The iSWM Policy Guidebook will be an abbreviated resource for local government officials and developers highlighting the broad and multi-faceted nature of the *integrated* Storm Water Management concept. The guidebook will discuss iSWM on the following four levels:

- A) Universal – Presenting the global need for better storm water management and proposing how iSWM can meet that need in North Central Texas.
- B) Federal, State, and Regional – Identifying partners in storm water management and overviewing the programs that they have that are anticipated to integrate with iSWM.
- C) Local – Outlining a truly comprehensive community storm management program that includes all the necessary elements of *integrated* storm water management.
- D) Site – Providing innovative design guidance for integrating effective storm water management throughout the planning, design, construction, operation, and maintenance phases of development.

The iSWM Design Manual for Development/Redevelopment will be a detailed step-by-step design document to guide developers, consultants, and government agencies on the control and management of storm water quality and quantity for new developments, redevelopments, and the retrofitting of existing problem areas. It will outline the most current and applicable storm water management techniques and provide criteria and rationales for the selection of structural and nonstructural *integrated* management practices (iMPs) to address the quality and quantity of runoff. For the improved estimation of runoff, the manual will include updated (and Texas Department of Transportation consistent) rainfall data compiled by the U.S. Geologic Survey for each of the 16 counties in the region. The manual will be flexible, yet uniform, and will provide guidance applicable to projects of all sizes and locations within the region. It will call for the determination of downstream impacts resulting from the increased imperviousness of development and will provide guidance to minimize and mitigate those impacts through integrated site design aimed at reducing the extent of storm water management facilities needed.

The iSWM Design Manual for Construction replaces NCTCOG's existing "Storm Water Quality Best Management Practices for Construction Activities" manual and provides guidance on the control of sediment and other pollutants on construction sites. The document is designed to help municipalities, property owners, developers, engineers, contractors, and others reduce the impact of storm water runoff from construction activities on downstream natural resources and properties. The manual provides the tools to develop an effective Storm Water Pollution Prevention Plan that meets state and local regulations and install and maintain storm water best management practices (BMPs) during construction activities. It has been approved by NCTCOG's Executive Board and is available on the web (<http://www.iswm.nctcog.org/Documents/Construction.asp>)

Activities for this proposal during 2004-05 include:

- Watershed Lab Studies
- Ongoing review of guidance materials

- Stakeholders Meetings for Engineers, Developers, Contractors, etc.
- Coordination with Regulatory Partners
- Public Hearing followed by 60 Day Formal Review
- Publication of Final *Design Manual* and *Policy Guidebook*
- Development of training curriculums & establishment of training programs at regional Training Center and elsewhere
- Model ordinance language and similar legal instruments for local government action
- Ongoing technical assistance to local governments and the development community
- Ongoing tracking and periodic refinements/updates of the *Design Manuals* and *Policy Guidebook*

Responsibility:	NCTCOG (Coordinator) Local Government Participants (to adopt and integrate into local development process) State/federal partners (to recognize and use) Development community (to implement)
Funding Sources:	Local Government Participants (cost-share) Tuition for training Grants from state/federal agencies to enhance
Timing:	Anticipated NCTCOG approval in late 2004; adoption by local governments & training begin in 2005; ongoing thereafter
Beneficiary:	Local communities, development community and citizens

Actions to Better Understand, Stabilize and Reduce the Hydrologic Risks

The mitigation action discussed in this section to better understand, stabilize and reduce the hydrologic risks is:

- **Trinity River COMMON VISION/UTRFS** ... undertake a variety of 50/50 local/federal cost share projects towards meeting the safe, clean & green goals

Action 10. “Trinity River COMMON VISION/UTRFS” ... undertake a variety of 50/50 local/federal cost share projects towards meeting the safe, clean & green goals

Target by Year 2010: Continued & expanded Trinity River COMMON VISION/Upper Trinity River Feasibility Study, to be serving the entire watershed with a variety of 50/50 local/federal cost share projects to better understand, stabilize and reduce the hydrologic risks

For most of the past 150 years, the dream for the Trinity River was that of a navigation canal with barges transporting goods more than 300 miles to and from the Gulf. An 1898 promotional button proclaimed the dream: “Dallas – The Inland Seaport of Texas.”

When that dream died in 1981 because of changing federal priorities, it was replaced by unrelated requests for federal permits to reclaim portions of the Trinity floodplain for commercial and residential development. These requests led to studies by the U.S. Army Corps of Engineers (USACE) that showed that the cumulative effects of the various development scenarios would bring massive new flooding. In response, officials from 14 affected jurisdictions, working under the auspices of the North Central Texas Council of Governments (NCTCOG), came together in 1989 to declare their support for a cooperative, regional approach to manage the Trinity River Corridor, one that aimed to create a safe, clean, enjoyable, natural, and diverse river corridor for the benefit of all North Central Texas. And thus began the **Trinity River COMMON VISION** program.

The cooperative regional effort to manage the Trinity River Corridor began in the early 1980's when USACE began working on a *Regional Environmental Impact Statement (Regional EIS)* to address the cumulative impacts of individual permitting decisions. A working group of staff from the affected local governments and NCTCOG provided input. The draft of the *Regional EIS* first compared the cumulative impacts of two opposite philosophical approaches for utilizing the river corridor—maximum environmental quality versus maximum development—and found that maximum development would result in flood flows that would overtop existing levees in Dallas and Irving. Given the seriousness of these preliminary findings, a special Strategy Committee of elected local government officials was formed to assist in the development of the *Regional EIS*.

As expected, local involvement in USACE's preparation of the final *Regional EIS* was much more intense, with many meetings and several new development scenarios crafted between the

two extremes. The final *Regional EIS* found that these more moderate development scenarios would not only result in the Dallas Floodway levees still being overtopped with catastrophic results, but that properties in upstream cities would also sustain considerable flood damages. Thus no city could assure adequate flood protection for itself by itself—only a common approach could be successful.

Although no proof was required, Mother Nature stepped in anyway. Major floods occurred in May/June 1989 in the Upper Trinity River. Over a dozen lives were lost as a result of the floods within the Metroplex and hundreds of millions of dollars of damages were sustained.

In 1989 NCTCOG adopted a *Regional Policy Position on Trinity River Corridor* that affirmed, among other key points, that local governments must be the stewards of the Trinity River Corridor because individual goals can only be achieved through cooperative management and a comprehensive approach addressing flood damage reduction, recreation, and environmental quality must be pursued.

Upon request of the affected local governments, Congress authorized the USACE to undertake a *Reconnaissance Study* to determine if a feasible flood protection plan(s) could be identified to reduce the risk of flooding, as well as address water quality, recreation, environmental enhancements, and other allied purposes. The USACE studied a variety of flood control options and found at least a dozen with positive benefit-cost ratios that merited further attention in the *Feasibility Study* phase.

It was now time for local governments to act. In 1990, each of the nine cities (Arlington, Carrollton, Coppell, Dallas, Farmers Branch, Fort Worth, Grand Prairie, Irving, and Lewisville), three counties (Dallas, Denton, and Tarrant), and two special districts (Tarrant Regional Water District and Trinity River Authority) with development and regulatory authority for the Trinity River Corridor executed interlocal agreements with NCTCOG to establish a formal structure for cooperative planning. A Steering Committee of elected officials was formally appointed to provide policy guidance, along with a staff task force for technical support.

NCTCOG, on behalf of the local governments, was identified as the administrative agent to enter into a cost-sharing agreement with the USACE for the *Upper Trinity River Feasibility Study*. The purpose of the *Upper Trinity River Feasibility Study* is to seek potentially feasible alternatives for implementation by the participating local governments to address flood damage reduction, water quality, environmental enhancement, recreation, and other related needs throughout the Upper Trinity River Basin.

In 1990, the first phase of the *Upper Trinity River Feasibility Study* began as an \$8 million six-year effort, with NCTCOG responsible for providing the \$4 million non-federal match. In turn, NCTCOG negotiated and administered a \$2 million grant from the Texas Water Development Board and obtained the \$2 million of local funds on a pro-rata annual formula based on the jurisdiction's land area within the corridor. NCTCOG's funding support came from a portion of the local share.

The Phase I Information Paper released in early 1995 identified more than 100 potential projects, including cooperative and comprehensive watershed studies, that could justify federal cost-share participation (see discussion in earlier section of this document).

The second phase of the *Upper Trinity River Feasibility Study* is currently in progress. This phase identifies implementable projects through Project Management Plans to reduce flood risks, restore environmental values, and meet other study purposes.

Since 1996, projects totaling more than \$12 million have been or are being implemented. For a project to be initiated, the local entity with jurisdiction must determine its interest and willingness to share in the cost of the project. A variety of 50/50 local/federal cost share projects are currently underway, including the Arlington Johnson Creek Buyouts, the Dallas Floodway/Elm Fork Project (Trinity River Corridor Project), the Fort Worth Clear Fork/West Fork Project (Trinity River Vision), the Lake Worth Project, the Trinity Trails System, the Corridor Development Certificate Process, and the Big Fossil Creek Watershed Study Project.

A pioneering effort that will serve as a model for other communities in the Upper Trinity watershed is the Big Fossil Creek Watershed Study. In order to address flooding and other priorities in the Big Fossil Creek watershed, the nine local governments in the watershed--Fort Worth, Tarrant County, North Richland Hills, Richland Hills, Haltom City, Watauga, Saginaw, Haslet, and Keller--acting through NCTCOG, have partnered with the USACE to conduct the Big Fossil Creek Watershed Study, which was initiated in 2001. What has made this \$1.85 million study possible is a cost-sharing agreement between the entities as well as generous grant awarded by the Texas Water Development Board that reduces the burden of the local costs by one-half.

The Big Fossil Creek Watershed Study currently represents the first and only cost-shared watershed study to be implemented to date as part of the *Upper Trinity River Feasibility Study* (several local governments have voiced interest in pursuing similar studies in other watersheds such as Ten Mile Creek, Rowlett Creek, and Mountain Creek, but formal commitments for watershed studies have yet to be agreed upon).

The Big Fossil Creek Watershed Study builds on the success of the ongoing Upper Trinity River Feasibility Study and the nationally prominent Trinity River COMMON VISION program. The Big Fossil Creek watershed, located in northern Tarrant County, encompasses 73 square miles and drains into the West Fork of the Trinity River.

The study area is one of the fastest growing urban areas in the country—a trend that is expected to continue. It is this explosive growth that makes the creek corridor increasingly vulnerable to flooding problems. The southern, or downstream, half of the watershed is almost fully developed with similar growth anticipated for the upper watershed in the coming years. As the headwaters experience increasing development, downstream communities face a growing risk of damage to property and loss of life due to flooding.

The Big Fossil Creek Watershed Interim Feasibility Study is comprehensively evaluating a range of flood damage reduction solutions to address safety aspects of Big Fossil Creek while identifying associated water quality, ecosystem restoration, and recreational opportunities.

This cooperative effort has 4 basic objectives:

- Provide direction to participating local governments to stabilize and reduce impacts of future floodplain development.
- Identify local flooding problems and develop/evaluate flood damage reduction alternatives including buyouts, floodproofing, channel modifications, levees, and detention reservoirs.
- Identify local water quality problems and develop/evaluate ecosystem restoration alternatives including riparian corridor expansion, buffer strips, wetland protection and creation, and easements.
- Develop a preliminary recreation and open space plan for proposed project lands.

These objectives are based on the protection of the Big Fossil Creek as an important regional resource that affects the overall public safety, quality of life, and welfare of residents in the Big Fossil Creek watershed. By incorporating new topographic mapping and improved engineering data for planning development, this study can result in better-managed growth throughout the watershed and, ultimately, a reduction in the risk of property damage and loss of life.

As the Big Fossil Creek Watershed Study is completed over the next few years, NCTCOG will continue to use the lessons learned from this study to explore the need for comprehensive, cost-shared studies in other troubled watersheds throughout the Upper Trinity River Basin.

For well over a decade, our region has seen almost unbelievable progress—cooperation on a scale unmatched elsewhere in the nation. Yet our local governments and their federal and state partners recognize that there are incredible opportunities still ahead.

NCTCOG's Strategic Plan for 1999-2003 established a vision of success for watershed management across all four major watersheds of the Upper Trinity. This vision has taken the shape of the broad **Sustainable Environmental Excellence (SEE)** initiative that, among other things, aims to translate the Trinity River COMMON VISION values of safe, clean, enjoyable, natural & diverse into **Safe Clean & Green** regional environmental corridors.

The shared vision of success for 2025 is that all regional environmental corridors are **Safe Clean & Green**. To help realize this vision, NCTCOG plans to continue and expand the Upper Trinity River Feasibility/Trinity River COMMON VISION. In expanding these award-winning achievements, NCTCOG anticipates serving all four major watersheds of the Upper Trinity River by the year 2010 with a variety of 50/50 local/federal cost share projects to better understand, stabilize, and reduce the risks of hydrologic hazards.

Responsibility: NCTCOG (non-Federal sponsor)
Local communities
USACE (Federal sponsor)

Funding Sources: USACE
Texas Water Development Board
Local communities (signatories to interagency agreement with NCTCOG)

Timing: Annual work programs to 2010
Beneficiary: Entire Upper Trinity watershed

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