



***iSWM* Resource Guide:**
FLOODPLAIN MANAGEMENT

October 2007

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SECTION 1 – Local Floodplain Management and Storm Water Management

1.1 Introduction

Floodplain management involves the designation of flood-prone areas and the limiting of their uses to those compatible with a given degree of risk. It is also aimed at minimizing modifications to streams, reducing flood hazards, and protecting the water quality of streams. As such, floodplain management can be seen as a subset of the larger consideration of surface water and storm water management within a local community.

Storm water management has traditionally been involved with the protection of downstream areas from flooding by mitigating the cause of increased flows, whereas floodplain management has dealt with mitigating the effects of floodwaters. However, new emphasis on water quality, nonstructural approaches and watershed management have caused storm water management and floodplain management to overlap, particularly in regard to the use of riparian areas for mitigating storm water quantity and quality. The development of riparian buffers and greenway corridors along streams and rivers can preserve floodplain areas and protect their function in safely conveying floodwaters and protecting water quality. Floodplain regulations and development restrictions, particularly when based upon the full built out 100-year floodplain, can greatly reduce future flooding impacts, preserve habitat, and may allow communities to waive storm water quantity control requirements for larger storm events.

The concepts related to floodplain management have broadened and matured in parallel with those of storm water management. Prior to the mid-1960's, flood control in Texas and elsewhere had been seen primarily as a structural control program wherein dams, levees and other flood control works were constructed to keep floodwaters away from developed areas. Beginning in 1966, the focus has steadily shifted toward protecting property and human life from flood waters through floodplain regulations, flood insurance, public education, post disaster assistance, the community rating system (CRS) and other flood loss reduction strategies often administered as part of a local storm water management program.

Since the early 1970's, with the passage of the Flood Disaster Protection Act, most communities in Texas have adopted, at a minimum, a floodplain ordinance and programmatic requirements to be eligible for the Federal flood insurance program. By the late 1980's, communities began to include the restoration and preservation of the natural values of floodplain areas into their floodplain management programs. Today the focus of floodplain management has broadened to include the notion that floodplains are only one component of an overall watershed-based water resource management program.

1.2 Floodplain Management Goals

Floodplain management is a decision-making and regulatory process, the goal of which is to achieve the wise use of local floodplains. "Wise use" means to define and make choices among often competing demands for floodplain locations. It includes the responsibility to regulate uses that are compatible with, and balance: (1) the need to preserve the natural and beneficial functions of floodplains, (2) allow for economic development where necessary and appropriate, and (3) minimize risk to human life and risk of property damage. Local floodplain policy should be developed based upon the following principles:

- Floodplain management should balance economic development, environmental quality, and health/safety issues.
- Development in flood prone areas, or adversely affecting floodplains, should be avoided unless it is considered necessary for the public interest.
- New developments adjacent to floodplains should not increase the risk of flooding for other properties.
- Capital and operating costs of floodplain management should be shared equitably among the public and specific beneficiaries instead of being borne by floodplain landowners.
- Consideration should be given to a combination of structural and non-structural tools to reduce flood damages.
- The floodplain should be considered in the context of the collective needs of the local community and as a part of a larger watershed.

SECTION 2 – National Flood Insurance Program

2.1 Background

In response to escalating flooding problems, Congress created the National Flood Insurance Program (NFIP) in 1968 to reduce flood losses and disaster relief cost by guiding future development away from flood hazard areas where practicable, requiring flood-resistant design and construction and transferring costs of losses to floodplain occupants through flood insurance premiums.

The National Flood Insurance Program has played a critical role in fostering and accelerating the principles of floodplain management. Flood insurance is available to floodprone communities through the NFIP, which is administered by the Federal Emergency Management Agency (FEMA). Prior to the NFIP, flood insurance was generally unavailable from the private sector and most communities did not regulate floodplain development.

The NFIP was broadened and modified by the Flood Disaster Protection Act of 1973, which requires the purchase of flood insurance as a condition for receiving any form of federal or federally related financial assistance, such as mortgage loans from federally insured lending institutions. Many communities have established floodplain management programs and adopted floodplain management statutes and regulations that go beyond NFIP requirements.

The National Flood Insurance Reform Act (NFIRA), signed into law in 1994, strengthened the NFIP by providing for mitigation insurance and establishing a grant program for state and community flood mitigation planning projects. The NFIRA also codified the Community Rating System (CRS), established objectives for CRS and directs that credits may be given to communities that implement measures to protect natural and beneficial floodplain functions and manage the erosion hazard. The CRS is an incentive program whereby communities that exceed the minimum requirements of the NFIP secure reductions in the flood insurance premiums for their residents.

2.2 NFIP Program Requirements

For flood insurance purposes, the regulatory *floodplain* is defined as the area inundated by the one-percent chance (100-year) flood [see Figure 2-1]. Within these outer boundaries there is another area, termed the *floodway*, in which the depths of flow and high velocities are such that construction of structures within these boundaries would entail unacceptable risk of loss and obstruction of the free flow of the waterbody. The area between the floodway and the outer edge of the 100-year floodplain is termed the *flood fringe*.

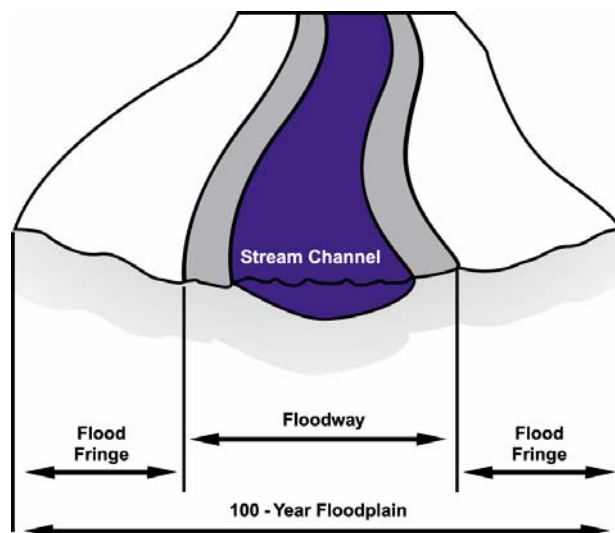


Figure 2-1 Floodplain Definitions

Minimum program requirements for communities under the NFIP include:

- Permitting for all proposed new development (includes new buildings, improvements to buildings, filling, grading, or any other human-caused change to the land);
 - Reviewing subdivision proposals to assure that they will minimize flood damage;
 - Anchoring and floodproofing structures to be built in known flood prone areas;
 - Safeguarding new water and sewer lines from flooding; and
 - Enforcing risk zone, base flood elevation, and floodway requirements after the flood insurance map for the area becomes effective.
- Figure 2-2 shows an example of a FEMA flood map used in the NFIP. Penalties for non-participation in the federal program involve the loss of ability to obtain flood insurance, and reduction or denial of access to federal disaster funding and home loans. Information on the National Flood Insurance Program can be obtained by contacting the Federal Emergency Management Agency Region VI office.

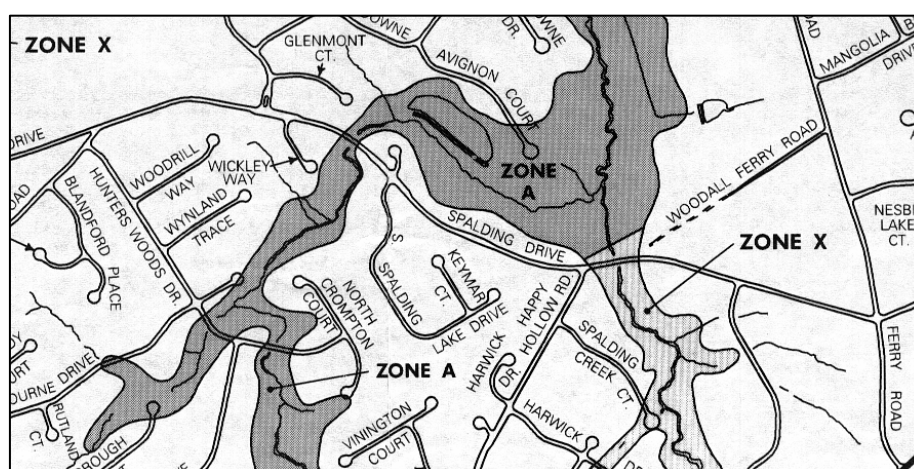


Figure 2-2 Example of a FEMA Flood Risk Map

2.3 Shortcomings of the NFIP

While almost all communities in Texas participate in the NFIP, the minimum requirements of the Federal program are generally seen as having several inherent weaknesses including:

- Little or no action to reduce damages in existing flood prone areas
- The tendency for the program to actually stimulate development in floodplain areas due to reduction of fears of substantial losses from flood damage
- Little or no coverage for the smaller feeder and headwaters streams
- The tendency for flood boundaries to shift over time as increased runoff from new development increases the floodplain width; resulting in structures thought to be beyond the area of flooding being more at risk of flooding
- Maps are not updated with broader insurance zones
- Does not account for development impacts outside the regulatory floodplain

Local communities add to the problems inherent in the NFIP through incomplete floodplain management including:

- Adopting land use regulations for flood hazard areas, such as those required to participate in the NFIP, and then failing to enforce them (for example, issuing permits that do not comply with the ordinance, or unwisely overruling the professional staff that administers the ordinance)

- Taking the position of doing only the minimum necessary to meet Federal requirements, and not integrating the broader issues of community health and safety, watershed and water quality management, and quality of life
- Agreeing to maintain a flood control or other project built with state or federal assistance, and then failing to provide for the maintenance in the community budget
- Taking "piecemeal" approaches that may correct one problem area but create a worse problem elsewhere.

It should be remembered that the NFIP is not designed to be a comprehensive floodplain management program but simply to reduce flood losses and provide for subsidized flood insurance. The NFIP should serve as the beginning of a broader floodplain management program. The next section provides guidance and approaches for developing a more comprehensive program.

SECTION 3 – Strategies and Tools for Improved Floodplain Management and Flood Mitigation

3.1 Introduction

Many Texas communities are seeking ways to break out of the cycle of ever increasing flooding, damage to older floodplain structures, streambank stability problems, loss of floodplain habitat, and increasing erosion and sedimentation problems. Approaches to dealing with these problems range from individual actions to comprehensive multi-objective management plans that integrate a wide range of community desires and goals dealing with floodplain areas. Table 3-1 summarizes a variety of floodplain management and flood mitigation approaches.

<p>1. Preventive policies keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation by building, zoning, planning, and/or code enforcement departments.</p>	
<p>Planning and zoning Open space preservation Floodplain regulations</p>	<p>Buffer requirements Storm water management requirements Drainage system maintenance requirements</p>
<p>2. Property protection activities are usually undertaken by property owners on a building-by-building or parcel basis. They include:</p>	
<p>Relocation Acquisition Building elevation</p>	<p>Floodproofing Sewer backup protection Insurance</p>
<p>3. Natural resource protection activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are usually implemented by parks and recreation departments, public works, or conservation agencies and organizations.</p>	
<p>Wetlands protection Streambank restoration Coastal barrier protection</p>	<p>Riparian zone/buffer restoration Erosion and sediment control</p>
<p>4. Emergency services measures are taken during a flood to minimize its impact. These measures are the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.</p>	
<p>Flood warning Flood response</p>	<p>Critical facilities protection Health and safety maintenance</p>
<p>5. Structural projects keep floodwaters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by public works staff.</p>	
<p>Reservoirs Levees/floodwalls/seawalls Diversions</p>	<p>Channel modifications Beach nourishment Storm sewers</p>

6. Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains.

Map information	Library
Outreach projects	Technical assistance
Real estate disclosure	Environmental education

3.2 Developing an Effective Local Floodplain Management Program

Most local programs have at their heart the objective of ensuring that flood levels are not increased, that public and private flood losses are minimized, and that natural and beneficial values of floodplains are preserved. This is typically accomplished through a combination of:

1. Restricting or prohibiting uses which are dangerous to health, safety and property due to water or erosion hazards or which result in damaging increases in erosion or in flood heights or velocities;
2. Requiring that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction;
3. Controlling the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of flood waters;
4. Controlling filling, grading, dredging and other development which may increase flood damage erosion;
5. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands; and
6. Seeking ways to reduce loss of natural floodplain areas and enhance natural benefits of floodplains in areas facing development.

Below are some of the ways that a community can improve its floodplain management program through a combination of structural and non-structural means making use of technology and tools.

Strategies to Keep Out of Floodprone Areas

- **Planning and regulatory floodplains** – Use two floodplain definitions in which the full built out floodplain is used for location and elevation of new construction, while the current condition FEMA maps are used for the Federal flood insurance program.
- **Use built out floodplain for regulation** – Regulate new development on the basis of full built out floodplains based on a master plan, even if the FEMA maps are not updated.
- **Land use limitations** – Limit the types of uses allowable in the floodplain to those necessary uses that are functionally dependent on being close to the water and those that would not be substantially damaged by flooding. Use the master plan and GIS capability to influence rezoning decisions before they are approved.
- **Provide incentives for staying out of the floodplain** – Develop the ability to make dedication of floodplain areas attractive to developers through transferable development rights, tax credits for conservation designs, partnering with developers to establish greenways along streams, or other approaches.

Strategies to Reduce Damage Due to Flooding

- **Implement a comprehensive floodproofing program** – Seek to reduce the amount of damage to local nonresidential structures located in the present floodplain through a combined capital improvement program, floodproofing, voluntary and attractive property acquisition, and education and warning (as appropriate). Develop a cost-shared floodproofing program for nonresidential structures that experience only shallow flooding and an elevation program for residential structures.

- **Enhanced first floor elevation requirements** – Implement a requirement to raise the first finished floor of all floodplain structures one foot (or more) above the full built out 100-year flood elevation.
- **Maximize floodplain flow capacity** – Minimize floodplain infill and enhance and maintain the conveyance of streams in floodprone areas on a priority basis.
- **Require effective storm water quantity management** – Ensure that upstream developments, remote from the floodplain or adjacent to it, mitigate the storm water runoff impacts of their development downstream to the point that the impacts are insignificant (see the iSWM Design Manual for Site Development).
- **Develop a flooding mitigation plan** – Develop a during- and post-flood mitigation and assistance plan that protects citizens from the risk of driving or falling into flood waters (e.g. traffic barricades in place well ahead of deep water conditions). The plan should seek to eliminate repetitive loss properties and seek to floodproof those damaged by flooding.

Strategies to Preserve and Restore Open Space and Natural Features

- **Innovative density trading away from flood prone areas** – Provide the ability and incentive to dedicate floodplain areas while retaining the ability to construct the same number of homes on a tract of land as without dedication. This is often integrated with a community greenway program or other riparian buffers requirements.
- **Extension of floodplain management to smaller streams** – Extend the floodplain program to feeder streams and to areas above the upper limit of mapped areas, and require backwater calculations on all streams not mapped.
- **Flood prone property and land acquisition** – Acquire flood prone properties, perhaps as part of a community open space or greenway program, and construct open space parks in their place.
- **Mandatory new construction floodplain dedication** – Require the dedication of floodplain lands and buffers for the purposes of flood protection, pollution reduction, and multi-objective riparian corridor recreation.

Strategies to Use Technology for Better Information Management Support

- **Downstream impact assessment** – Implement a mandatory requirement to assess and mitigate the impacts of proposed new developments downstream to a point where the impact is negligible. Mitigation can include the purchase of a flood easement, on-site controls, system improvements, etc. This might also include the development of watershed master plans for the purposes of solving floodplain problems and avoiding exacerbating problems.
- **Aggressive map maintenance** – Require mandatory letters of map amendment or revision for all new floodplain developments, or a mandatory requirement for backwater profiles to be privately developed for proposed developments along all streams. Map estimated full built out floodplain.
- **On-line GIS and models** – Implement the use of GIS and on-line models in assessing new developments as they are proposed and prior to re-zoning request approvals. The city or county would work with the developer in coming up with an alternative that reduces impacts and preserves floodplain areas while maintaining economic viability.
- **Make floodplain maps accessible** – Make the community's most current floodplain boundaries available on the Internet for easy access. Identify those persons in the floodplain and notify them of the availability and advisability of flood insurance.

3.3 Watershed / Interjurisdictional Issues

Ideally, floodplains should be managed at the watershed level. Activities that result in runoff anywhere within the watershed can increase the incidence and magnitude of floods downstream. Intergovernmental cooperation and coordination is a critical consideration especially when multiple jurisdictions contribute to collective flood problems or detract from floodplain resources.

Regulatory consistency and coordinated flood response will ensure that land uses and flood analyses are compatible between jurisdictions. There are many ways communities can pool their resources, technical, financial, and personnel, for flood damage reduction studies, hydrologic and hydraulic watershed modeling, and a variety of floodplain and flood mitigation projects.

What is iSWM?

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

Why iSWM?

Comprehensive guidance is needed for the region in order to integrate the management of storm water quantity and quality throughout the planning, design, construction, operation, and maintenance of storm water infrastructure that will protect water quality, minimize streambank erosion and provide flood control both onsite and downstream. iSWM guidelines will greatly enhance the storm water management initiatives of North Central Texas area communities by improving and streamlining the development process for communities, developers, and consultants. The short-term and long-term impacts on the storm water quality and quantity improvements brought about by these guidelines will prove invaluable for the region.

What iSWM documents are available?

iSWM Design Manual for Construction – December 2003

Provides guidance on the control of sediment and other pollutants on during construction activities.

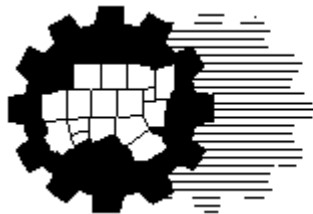
iSWM Design Manual for Site Development – January 2006

A detailed design document to guide developers, consultants, and government agencies on the preparation of an *integrated* Storm Water Management Site Plan to control and manage storm water quality and quantity for new developments and redevelopments.

iSWM Resource Guides – October 2007

Provide guidance for local jurisdictions and developers on various aspects of effective urban storm water management.

These documents can be found at <http://iswm.nctcog.org/>.



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