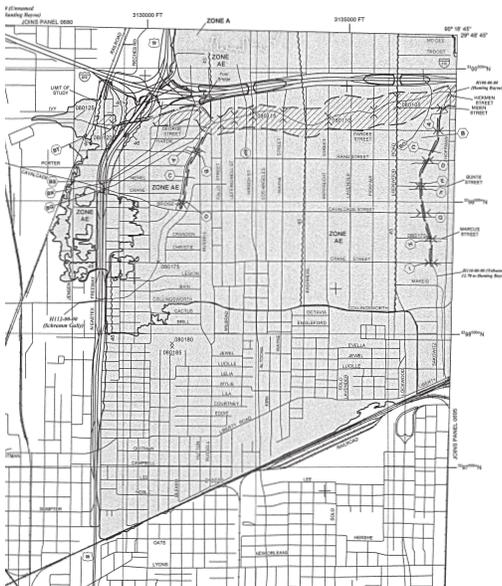


## Fact Sheet #4

# How are floodplains designated?

Floodplain boundaries are not visible lines within the natural environment, rather they are lines drawn on a map to approximate areas susceptible to flooding. While it is not an exact science, floodplain mapping can approximate what areas will be inundated during a specific storm event. Floodplain maps are intended to be used as a tool for cities, homeowners, developers, and insurance companies to understand the risk of flooding at locations near streams, bayous, or other riverine features.

**Figure 1** excerpt from FEMA Flood Insurance Rate Map (FIRM map) showing floodway, 100-year (SFHA) and 500-year (Zone X) floodplains.

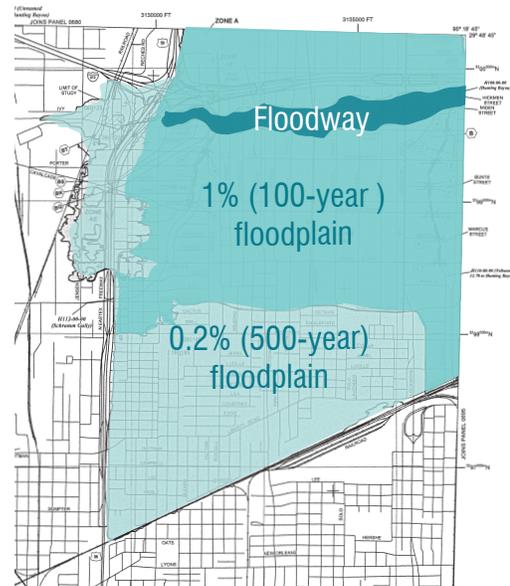


### KEY TERMS

**Floodplain** any land area bordering a river, stream or bayou that is naturally susceptible to flooding by an Annual Exceedance Probability (AEP) storm event.

**Annual Exceedance Probability Storm Event** the probability of that storm event exceeding a particular storm discharge or flood level within one year. For example, equivalent return period terms,  
**1% AEP** = a flood that has 1 in 100 chance of occurring in any year.  
**0.2% AEP** = a flood that has 0.2 in 100 chance of occurring in a year.

**Figure 2** FIRM map with diagrammatic overlays showing floodway, 100-year (SFHA) and 500-year (Zone X) floodplains.



The three main steps to determining floodplain boundaries are:

- 1 Determine rainfall amount in given storm event; a statistical analysis is performed on the historic rainfall records to determine the 1% AEP rainfall amount. These values, from past rain events, reflect a storm that lasts exactly 24 hours. These rainfall amounts are utilized in the development of hydrologic models as discussed in Step 2 below.
- 2 Determine how much floodwater will be generated in a given storm event. This can be determined using a **hydrologic** model. These models take the amount of rain that falls on the ground and determine how much soaks into the ground, how much runoff is generated, and how long it will take runoff to travel to a stream. Factors that affect the amount of floodwater:
  - Rain amount
  - Soil type
  - Land use
  - Terrain
  - Shape of watershed
  - Slope
  - Type of drainage pathways

- 3 After determining the amount of floodwater, the next step is to determine how high the floodwater will get in and around a river, which can be done using a **hydraulic** model. Factors that affect the height of floodwater:
  - Channel size
  - Channel shape
  - Channel material
  - Downstream capacity

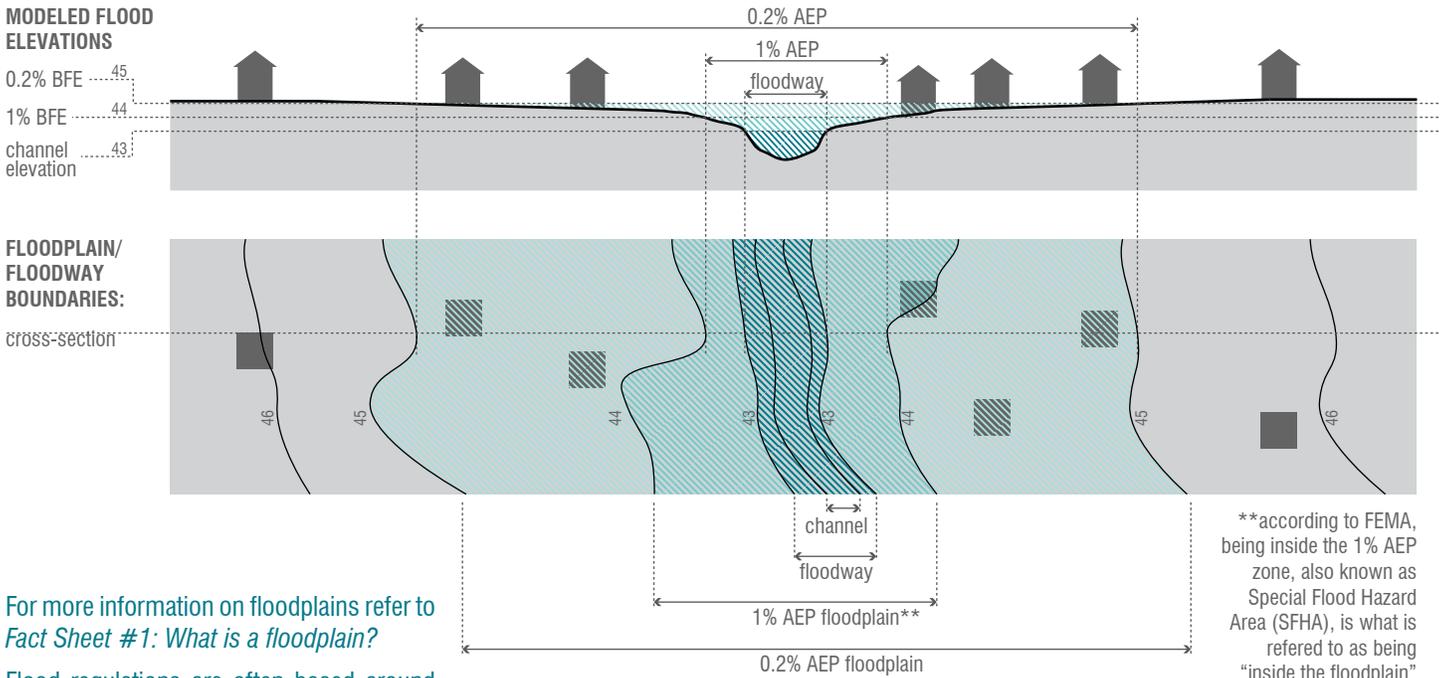
### KEY TERMS

In simple terms, hydrology determines how much water reaches channels, and hydraulics determines how high the water rises and how fast it moves in and through channels:

**Hydrology** is the study of rainfall and runoff in connection to geography and geology - how water moves through the hydrologic cycle.

**Hydraulics** is the study of the motion of water - hydraulic analysis is done to model stormwater flows.

Topographic data are used in conjunction with the **modeled flood elevations** to determine where to draw the **floodplain boundary**. When an elevation of a flood at a certain location is determined, the floodplain boundary is determined by where that elevation intersects the ground on both sides of the channel. This elevation, called the **base flood elevation (BFE)**, is a common basis for flood regulations. It is typical in most jurisdictions to map the floodplain boundary resulting from the 1% AEP and 0.2% AEP and the floodway.



For more information on floodplains refer to **Fact Sheet #1: What is a floodplain?**

Flood regulations are often based around the BFE, the floodway and the 1% AEP floodplain. Refer to **Briefing Document #4: Flood Regulations**.

The Federal Emergency Management Agency (FEMA) keeps floodplain maps for all studied areas, which are used for insurance and regulatory purposes. Floodplain boundaries can change due to new development, erosion and changes in topography, and more detailed analyses. The process to change a mapped floodplain boundary can take several years, due to coordination and data review.

FEMA maps only show areas that are susceptible to inundation by bayous and creeks overtopping their banks in watersheds greater than one square mile. However, flooding occurs outside of these boundaries as well, whether due to heavy rain, undersized storm sewer systems, sump areas, land use etc.

Of all of the severe storms that have occurred, and all of those that will occur in the future, none is likely to create the exact floodplain boundaries represented on a floodplain map. Some reasons that cause this difference include:

- Rain does not fall evenly or in predictable patterns that match with our analysis assumptions
- The nature of riverine environments is ever-changing
- Land use changes are always occurring
- Heavy storms can bring debris and obstructions that alter the path and depth of floodwater

## KEY POLICY QUESTIONS

Should we change the way we map floodplains?

How will floodplain maps change based on updated rainfall data?

For more information & interactive floodplain maps visit:

FEMA Map Service Center:  
<https://msc.fema.gov/portal/search>

Harris County Flood Control District Flood Education Mapping Tool:  
<http://www.harriscountyfemt.org/>

Greater Houston Flood Mitigation Consortium:  
<http://houstonconsortium.com>