GREATER HOUSTON FLOOD MITIGATION CONSORTIUM

5 Fact Sheet
How does rainfall drain away?

All of the Houston region drains to Galveston Bay. While some of the rain that falls evaporates or soaks into the ground, the vast majority of the rain will eventually flow to the Bay. But its path can be complicated, and the water flowing through every piece of that path can result in flooding. While bayous rising out of their banks is the most obvious cause of flooding, much of the flooding we see comes from water that has not yet made it to a bayou. Bayous are only part of our stormwater system. Water flows at different rates over different ground surfaces. It flows slowly over soil covered with prairie or vegetation because such land is absorptive, while it flows quickly over pavement or concrete. Flooding can be caused in both instances, if water does not drain quickly enough it will pond and create overland flooding, and if it flows too quickly into a bayou that does not have adequate capacity, it can cause the bayou to overflow and flood the areas around it.

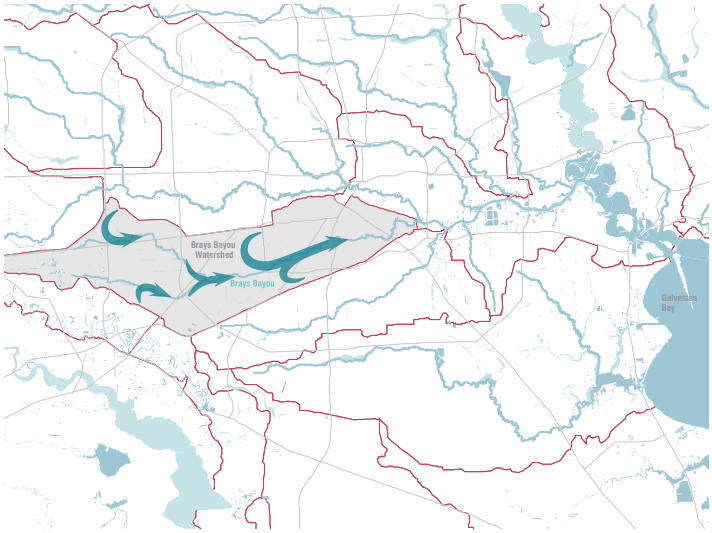

Figure 1 Highlights Brays Bayou watershed draining into Galveston Bay through the ship channels

Path of Water

Water that falls within a watershed may drain naturally as overland flow or through man-made features, such as storm drains or diversion channels. Any rainwater within a watershed boundary that becomes runoff will start out as overland flow and eventually make its way into a creek or bayou and ultimately into a reservoir or the ocean.

1. Rain that falls on land will either evaporate, soak into vegetation, infiltrate into soil, or run off.
2. Rain that lands on impervious surfaces, such as pavement, will drain off of those surfaces at a faster rate. Roofs and large areas of pavement often have drains that connect directly to ditches or storm sewers.

   In developed areas, water flowing across the ground will soon reach a man-made drainage system. Some areas have open ditches along roadways that collect water. Others have underground storm sewers that collect water from inlets and drains. Both ditches and storm sewers are built to slope towards a larger waterway.

   In major rain events, storm sewers and roadside ditches overflow. In the City of Houston, storm sewers are designed to handle a storm that has a 50% chance of happening in any given year, which is about half as much rain as the 1% "100-year" event. Streets are designed to fill with water and act as drainage channels to drain water from the 1% event. If the streets cannot handle the rainfall, water starts running overland. This is called "sheet flow", and it may flood houses. The ditches and storm sewers convey water to primary waterways (larger streams, creeks, and bayous).
3. Small channels or tributaries often combine together to become a larger common body of water. As the larger waterways fill with water, the tributaries fill up as well, backing water up to the surrounding areas.
4. In order to reduce the amount of water flowing into a large channel, or bayou, sometimes detention ponds will be used to temporarily store water. *Refer to Fact Sheet #2: What is a Detention Basin.*

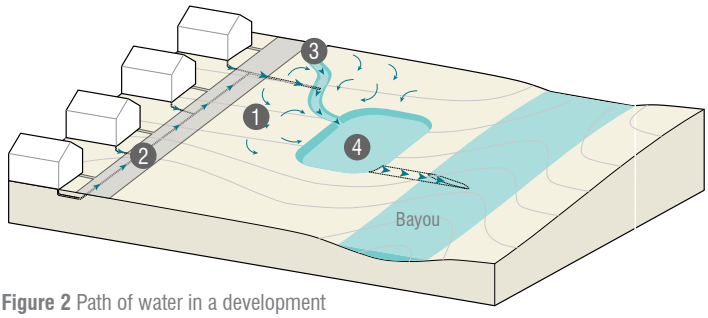

Figure 2 Path of water in a development

KEY TERMS

Watershed is a geographical area of land that drains to a larger common body of water.

Bayou is a channel of water in a relatively shallow region. In Houston, most streams (which might be called rivers or creeks elsewhere) are called bayous. All bayous in the Houston region carry water downstream to Galveston Bay.

Stormwater is water resulting from rainfall on land.

Storm Sewer Pipes are located under a city street and carry stormwater to bayous. These are different from sanitary sewer pipes, which carry sewage from kitchens and bathrooms.

Harris County Flood Control District (HCFCD) is a distinct governmental entity with the Commissioners Courth acting as its board of directors.

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Responsibility and Maintenance of Facilities

As rainwater travels from a site to a storm drain system or channel and ultimately to a larger body of water, different organizations are responsible for the infrastructure and conveyance of the water. Responsibility and maintenance of facilities are discussed below.

Cities have jurisdiction over local stormwater infrastructure within their city limits. These systems include:

- Storm sewers
- Roadside ditches and culverts
- Small local channels
- Local storm drains

In unincorporated areas, jurisdiction falls to the county. Most stormwater infrastructure is owned and maintained by governmental entities, such as cities, counties, or municipal utility districts. These governmental entities fund infrastructure and maintenance through taxes and sometimes stormwater fees. Developers might initially construct the infrastructure, but then usually turn them over to these governmental entities to maintain.

Harris County Flood Control District (HCFCD) maintains and has jurisdiction over:

- Bayous
- Tributaries
- Creeks
- Some enclosed channels
- Regional detention ponds

They use a combination of local, state, and federal money to fund drainage projects, using property taxes, bond proceeds and/or grants. Large rivers and bayous are also maintained by the HCFCD and can receive funding from the United States Army Corps of Engineers (USACE) for large flood control projects.

USACE is responsible for maintaining federal projects, such as, large levees and dams, regional reservoirs, and navigable channels. These projects are federally funded through general funds and specific appropriation by the US Congress.

Aging Infrastructure

Stormwater infrastructure is intended to convey stormwater runoff to our streams and creeks. **Sanitary sewer infrastructure** is intended to carry sewage from homes and businesses to treatment plants before being discharged into our streams and creeks. These systems should be completely separate from each other. However, many sanitary sewer systems are aging, leaky, and do not have proper connections. Thus during flooding events water meant to be conveyed in stormwater systems ends up filling the sanitary sewer systems and these systems become overwhelmed, causing them to overflow without being treated. This is a public health concern. Sanitary sewer overflows release possible disease-causing pathogens into the floodwaters.

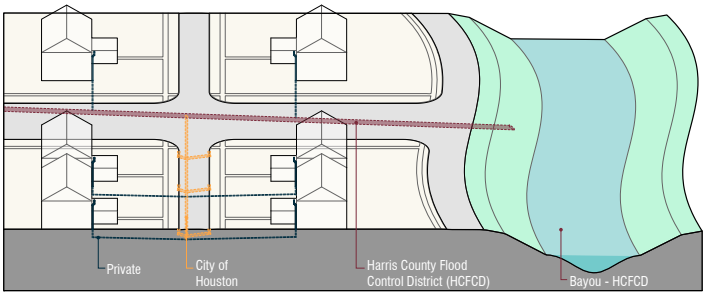
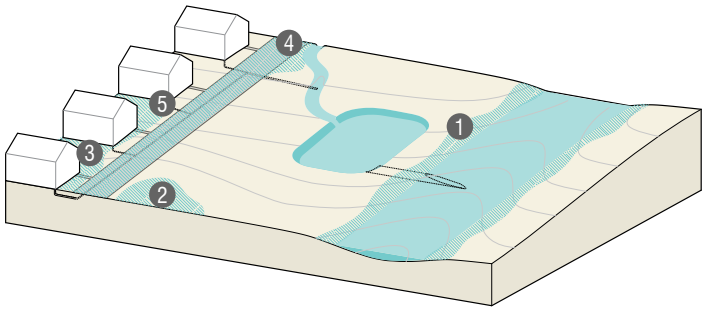


Figure 3 Water drainage facilities

Types of Flooding



1. Channel overflowing its banks and inundating addjacent areas.
2. Unintentional ponding of water in low-lying areas that are not directly connected to a channel.
3. Overland runoff flowing across property.
4. Streets flooding when the capacity of infrastructure is exceeded.
5. Flooding due to storm sewers and ditches backing up as major drainage channels fill.

KEY POLICY QUESTIONS

How do we ensure our natural and man-made drainage systems keep up with development?

How do we ensure that drainage is maintained and operating as it is intended to?

How do we secure funding for drainage infrastructure upgrades?

For more information visit

HCFCD on watersheds:
hcfcd.org/drainage-network/

Greater Houston Flood Mitigation Consortium:
houstonconsortium.com