

Playa Lakes Provide Flood Protection for Texas High Plains Residents

Levelland, TX – While they comprise just two percent of the land in the Texas High Plains region, playa lakes are one of the most important ecological features in the High Plains.

These essential landforms found in arid and semiarid climates alternate between being filled with water and dry at irregular intervals. This cycle of boom and bust provides water, wetlands and food for wildlife and waterfowl—and flood control for the people of the region.

There are many theories as to the origin of playa lakes, but the most widely accepted is that playas are either carved by wind or formed by land subsidence. With 19,300 playa lakes covering the High Plains, Texas has the highest density of playas in North America.

The City of Levelland, some 40 miles west of Lubbock, is in Hockley County, an extremely flat area with an elevation of 3,000 feet where playa lakes are ubiquitous.

“Playa lakes are an asset,” said Floodplain Manager Larry Sprowls, who also serves as the Hockley County Judge. “If it weren’t for the lakes, during a heavy rainfall, water would spread out all over the place. We would virtually be standing in about three inches of water here in the City of Levelland.”

The term “playa” describes the shallow, enclosed flat basin of a desert plain. After rainstorms, these basins typically fill with rain, creating a freshwater lake that is generally large in area but very shallow. When the water evaporates or soaks into the surrounding soil or aquifer, a playa is formed. The playa appears as a flat bed of clay encrusted with precipitated salts.

Although some playas are susceptible to flooding, they are an essential element of drainage systems.

“Flooding issues on the part of playas were primarily due to people building near them prior to the adoption of floodplain ordinances,” said Rick Osburn, Levelland’s City Manager. “Now, all new construction must adhere to the new ordinances.”

Due to the flat topography in the City of Levelland, drainage requirements and regulations were established to protect drainage areas from flooding, prevent pollution of watersheds and the encroachment of buildings, and improve natural drainage channels.

The regulations include:

- requiring private parties to get permission from the Planning and Zoning Commission to do any work in a playa;



Leftwich Park Lake following a September 11, 2008 rain event. Photo provided by: Steven Nelson, civil engineer, Lubbock, TX.



Elmore Park Lake following a September 11, 2008 rain event. Photo provided by: Steven Nelson, civil engineer, Lubbock, TX.



Dupree Park Lake following a September 11, 2008 rain event Photo provided by: Steven Nelson, civil engineer, Lubbock, TX.



- restricting the amount of a lake area that may be reclaimed for private use through a cut and fill plan to no more than 30 percent of the total area;
- dedicating land within a lake area as public land for storm water drainage; and
- requiring that a lake not have its water holding capacity decreased due to repetitive cut and fill, redesign, or lake leveling.

Located in adjacent Lubbock County, the City of Lubbock’s code of ordinances also requires that playa lake areas be dedicated as storm-water drainage and impoundment easement areas. They are an essential element of drainage systems both in and around the city.

The city is susceptible to flash flooding from short, but intense rainfall events, as well as urban flooding in low-lying areas and street flooding. In recent years, the rainfall events have been infrequent, but intense.

In September 2008, the city experienced localized heavy rainfall of 7.8 inches over 24 hours. In July 2010, the city also experienced localized heavy rainfall over the course of three days. The Lubbock area recorded several locations with rainfalls totals in excess of 7 inches.

“While these lakes are essential to flood control, depending upon the type and size (an overflow or non-overflow lake), they make us susceptible to long-term drainage problems when there is a huge rain event or prolonged wet season,” said Floodplain Manager Steven Nelson, a civil engineer.

A non-overflow lake is one that can hold more than the rainfall from a 100-year event—in Lubbock’s case, 6.8 inches of rain in 24 hours—without overtopping its banks and flooding.

“If the water doesn’t evaporate or doesn’t cascade from one lake to another, we have to resort to emergency pumping. During a record rainfall, three days of three inches of rain, we had to put in temporary pumps for four months,” Nelson said. “To address long-term rainfall events, we have invested \$100 million in a gravity drainage systems to a number of our playa lakes.”

According to Nelson, these gravity drainage systems were installed in both overflow and non-overflow lakes, and discharge to a channel, downstream playa, or the Brazos River. Like a bathtub or sink overflow drain, they allow the lake to drain back down after a large event and restore its holding capacity within two to four weeks.

To safeguard lives and property, the City of Lubbock adopted the following ordinance regarding building within a playa lake area:

- If the structure is located within a playa lake, the lowest floor elevation (LFE) shall be a minimum of one foot above the FEMA base flood elevation (BFE) or a minimum of two feet above the lake overflow, whichever is higher.
- If the playa is a ‘true non-overflow lake’ (where it doesn’t overflow even in a 500-year event), the LFE shall be a minimum of one foot above the 500-year event.
- If a Drainage Analysis has been prepared for a new development, the LFE is to be a minimum of six inches above the established BFE.

“The BFE has to be established through engineering calculations related to the stage storage capacity for each individual playa lake,” said Nelson. “In addition, the lakes must be examined to determine if an upstream lake could discharge to a downstream lake. This is challenging as high quality topography is needed to produce accurate BFEs on the order of one-foot contours.”