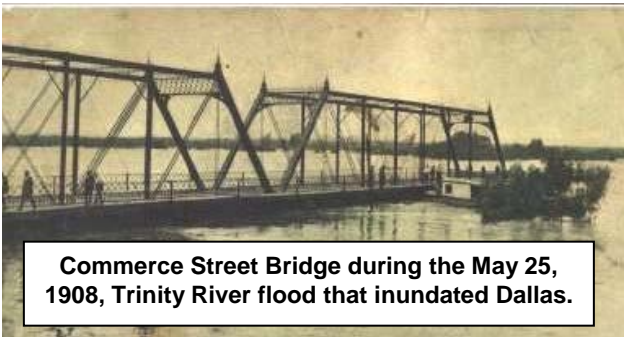




DALLAS FLOODWAY TIMELINE

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG®



Commerce Street Bridge during the May 25, 1908, Trinity River flood that inundated Dallas.

Trinity River Corridor Project Chronology

A century ago floodwaters swamped a growing city on the banks of the Trinity River, a historic touchstone for Dallas. The 1908 Dallas flood killed 5, left 4,000 homeless and caused millions of dollars in property damage. It unleashed decades of efforts to build a modern floodway system to protect Dallas as it quickly grew to become one of the nation's 10-largest cities and focal point of a metro area of 6.5 million people. Protection efforts included building sump areas and pumps, flood-control reservoirs upstream and fortifying levees to contain an 800-year flood.

1911 – Landscape architect c produces a master plan for the growing city, which includes a levee system to control the Trinity River. It's not until 1919 that a revised Kessler Plan is embraced that includes levees, streets, playgrounds, parkways, parks and rail transportation facilities. Planning and funding take nine more years.

24 June 1928 – Construction begins on a massive floodway improvement project by the Dallas County Levee Improvement District. One thousand men are employed for 700 working days. Up to 15 draglines, working 24 hours a day, move 22 million cubic yards of dirt to build the East and West Levees and move the river a half mile to the middle of the floodway.

1930s – Impact of tight finances from the Great Depression hurts operations and maintenance of the levee system.

1942 – The levees hold an April flood – largest peak flow since the 1908 flood – but worries persist about the poor shape of the levees.

1945 – 49th Texas Legislature refinances existing levee debt and reorganizes Dallas levee districts to provide a revenue stream from the state. Law's language acknowledges another flood like April 1942 could break the levees.

1948 – U.S. Army Corps of Engineers Galveston District documents the poor condition of the Dallas levees,



Montgomery Ward building, 1949 Fort Worth flood

including numerous levee slides, severe levee cracking and levee subgrade issues regarding potential seepage.

May 1949 – Trinity River flood kills 11 in Fort Worth and causes \$11 million in damages to the business district.

1950 – In the 1949 flood's wake, Congress commissions a new Corps of Engineers District in Fort Worth to carry out flood control projects in the Upper

Trinity River Basin in Dallas and Fort Worth, and to take over construction of a series of upstream reservoirs: Lake Lewisville (impounded 1955), Grapevine Lake (1952) and Benbrook Lake (1952).

1950s – Major Corps Dallas Floodway reconstruction project begins. It deepens the river channel, modifies levees to flatten the levee slope to 3-1 width-to-height ratio, increases the levee crown width to 16 feet and improves the interior drainage system. The Dallas Floodway in this iteration is designed to carry the Standard Project Flood.

1958 – Corps completes Dallas Floodway reconstruction project.

1960 – Two major forces over the coming decades combine to reduce the effectiveness of the newly completed Dallas Floodway. First, significant urbanization in Dallas-Fort Worth increases the runoff produced by the Trinity River watershed. This increases the water flow volume greater than anticipated for the Floodway's Standard Project Flood event. Second, a significant land use change just downstream from the Floodway also cuts the system's

capacity. Thousands of acres of primarily privately owned farmland gradually reverts to woodlands and creates a more robust Great Trinity Forest that slows the discharge of waters from the Floodway.

1968 – The state-authorized Dallas County Flood Control District expires under sunset provisions. The cities of Irving and Dallas assume Floodway maintenance and operations within their respective boundaries. The Corps continues oversight and inspections and coordinates with both cities.

1984 – The Fort Worth District begins drafting a regional environmental impact statement to determine whether the cumulative impact of the ongoing commercial and residential development boom in the Dallas-Fort Worth metro area compromises existing flood control protection in the Upper Trinity River Basin.

1986 – Corps' Joe Pool Lake comes online for additional flood control capacity in the Upper Trinity River Basin.

1987 – Corps' Lake Ray Roberts comes online for additional flood control capacity in the Upper Trinity River Basin.

29 April 1988 – The Regional Environmental Impact Statement Trinity River and Tributaries determines that development could have a measurable and significant cumulative impact, which could compromise existing flood control protection and impact wetlands. The Record of Decision specifies criteria for Clean Water Act Section 404 permit applications including: 1. No rise in the 100-year or Standard Project Flood surface elevation for the proposed condition will be allowed; 2. Maximum allowable loss in storage capacity for the 100-year flood is 0 percent, and for the greater and less frequent Standard Project Flood is 5 percent; 3. Alterations in the floodplain may not create or increase an erosive water velocity on- or off-site.

October 1988 – The Fort Worth District begins a reconnaissance study of the Upper Trinity River Basin, focusing on flood risk management. Twelve areas are found to be at a greater risk of flooding and warrant further study.

15 December 1988 – Cities and counties in the Trinity River Corridor, having formed the Trinity River Steering Committee, propose a Corridor Development Certificate process to comply with Section 404 permit guidelines from



May-June 1989 flooding is the worst in the Dallas Floodway in 40 years. Storms return in the aftermath of Hurricane Norma in October. The president declares Dallas County a disaster area. Worse flooding follows in 1990 when back-to-back storm systems hit.

the Record of Decision in April. The group is facilitated by the North Central Texas Council of Governments.

1989 – Two flood events occur. One, in May-June, cause \$12 million in damages, from Eagle Mountain Lake in Fort Worth to South Dallas to Kaufman County. Several drownings result. Mansfield records overnight rainfall May 16-17 of 13 inches; water flows over Lake Arlington emergency spillway for the first time. It's the worst Dallas flood in 40 years. Trinity River crests at 43.3 feet in Dallas. Later in October storms from the aftermath of Hurricane Norma cause \$6 million in damages. President declares Dallas County a disaster area: 30 homes destroyed, another 450 homes and businesses damaged.

1990 – Yet another major flood becomes the flood of record since Dallas Floodway built. Heavy rains all April climax in two storms April 24-27 and May 1-4. Damage totals \$300 million to Trinity River Basin; state declares 28 counties in the basin disaster areas by the

state including Dallas, Denton, Collin and Tarrant counties. Trinity River crests at 47.1 feet in Dallas, highest since 1908. Some 200 houses and business are flood-damaged in Rochester Park, two dozen houses damaged in Southeast Dallas and Oak Cliff. Local damage pegged at \$30 million.

23 May 1991 – Trinity River Corridor Steering Committee approves Corridor Development Certificate Manual. It outlines the regional process for Clean Water Act Section 404 compliance to guidelines set in the Corps' 1988 Record of Decision. These standards become known as the Corridor Development Certificate Common Regional Criteria. It helps ensure that floodplain development does not exacerbate flooding.

1991 – Major flooding in April, October and December. Rainfall breaks 51-inch annual record set in 1932. A 20-year flood in December sends the Trinity River crest over 44 feet at Dallas. Floods kill nine and cause \$242 million in damages. Rochester Park Levee is partially constructed by the city of Dallas when the flood hits. Dallas and Tarrant counties declared disaster areas.

1989-1991 – The extended rainy period for the Upper Trinity River Basin upends predictions. Design engineers for Lake Benbrook in Fort Worth, completed in 1952, had estimated that the flood control reservoir would rise as high as the 710-foot spillway elevation only once every 40 years, and that elevations of 715 feet or greater would be reached only once every 100 years. Yet the lake levels reached 717 feet in May 1989, 718 feet in May 1990, and 713 feet in December 1991, contributing to the flooding downstream in Dallas.

1993 – All participating cities and counties on the Trinity River Corridor Steering Committee amend their floodplain ordinances to adopt the Corridor Development Certificate Common Regional Criteria and process. Any proposed private or public project within the Regulatory Zone, the Federal Emergency Management Agency's 100-year regulatory floodplain, must obtain a CDC prior to start of construction.

1994 – City of Dallas raises the Central Wastewater Treatment Plant Levee, originally built in the 1940s.

1996 – Congress directs that the city-built Rochester Park and Central Wastewater Treatment Plant Levees be added to the federally authorized Dallas Floodway System.

1998 – Dallas voters authorize the largest bond package in city history – \$246 million – to fund flood control, transportation and recreation projects in the Trinity River Corridor.

1 December 1999 – Record of Decision for Environmental Impact Statement (EIS) for Dallas Floodway Extension Project to construct a chain of flood control wetlands, the Lamar and Cadillac Heights Levees, move the Trinity River channel under the I-45 bridge, improve existing Rochester Park and Central Wastewater Treatment Plant Levees and add recreation features downstream of existing Dallas Floodway.

April 2002 – Federal court halts construction of first Dallas Floodway Extension wetland cell after ruling against the Corps on one of four counts in a suit filed by project opponents. Judge rules the Corps needs to further consider the cumulative impacts of other similar projects nearby. Corps announces plan to prepare Supplemental EIS.

2003 – City of Dallas writes the long-range Balanced Vision Plan to reclaim the Trinity River as a great natural resource and unique public domain and a model of environmental stewardship that embodies the spirit of the Kessler Plan idea of nearly a century before.

April 2003 – Corps issues Supplemental EIS. It finds no anticipated rise in adverse cumulative effects of anticipated actions near the Dallas Floodway Extension Project.

2004 – Cell D is the first of a planned 3.7-mile long chain of wetlands in the Dallas Floodway Extension Project to be excavated a year after Supplemental EIS is approved. Plantings and ecosystem management begin in 2005. It lowers upstream flood risk by opening an alternative path the Trinity River can occupy during flood stage. It also creates a new quality habitat in the heart of the city.

29 August 2005 – Hurricane Katrina hits New Orleans. More than 1,500 lives are lost. Heavy rainfall delivers 14 inches in a 24-hour period. Storm surge and waves cause 50 major levee breaches and 169 of the system's 350 miles of protective structures are compromised. About 80 percent of New Orleans floods. The nation's costliest disaster forces the Corps to improve how it evaluates levee safety and its overall Levee Safety Program.

November 2007 – Congress authorizes the Dallas Floodway Project for construction in the Water Resources Development Act of 2007 at a total project cost of \$459 million, with an estimated federal share of \$298 million and non-federal share of \$161 million. The project will focus on reducing flood risk for the section of the Dallas Floodway System upstream from the abandoned AT&SF Bridge, past downtown Dallas and west to several miles beyond the confluence of the West Fork and Elm Fork of the Trinity River.



By 2011, seven years after excavation, Wetland Cell D has matured into a new wildlife habitat, which lowers flood risk for Dallas and improves water quality.

3-5 December 2007 – Corps conducts Periodic Inspection No. 9 for East and West Levees and Periodic Inspection No. 1 for Rochester Park and Central Wastewater Treatment Plant Levees, all located in the Dallas Floodway System. In the post-Katrina era, the Corps changes its levee inspection and reporting methodology, which slows writing of this Periodic Inspection report.

2008 – Cell G is the last of a Lower Chain of Wetlands in the Dallas Floodway Extension Project to be excavated. Three more wetland cells further upstream, comprising an Upper Chain of Wetlands, await design and construction.

31 March 2009 – Corps delivers final Periodic Inspection No. 9 report to the city. It rates the Dallas Floodway System “unacceptable” meaning that it would not contain a Standard Project Flood. The Federal Emergency Management Agency subsequently de-accredits the Dallas Floodway and begins the process of re-drawing a new 100-year floodplain map for the city for its National Flood Insurance Program. Of 214 items, the Corps inspection rated 91 “acceptable,” 80 “minimally acceptable” and 43 “unacceptable.” Those items deemed unacceptable fell into



A March 2006 flood near the Pavaho Sump in West Dallas demonstrates the need for a string of new pump stations along the Trinity in Dallas to quickly drain neighborhood storm waters.

the following categories: insufficient levee crest height, encroachments and penetrations that could impact levee performance (or reduce levee access for maintenance/flood-fighting), damaged gate closures, cracking in the levees, erosion, vegetation, siltation and channel instability.

March 2009 – Fort Worth District embeds Trinity Program Office at Dallas City Hall to aid collaboration and communication with the levee sponsor to remedy issues highlighted in Periodic Inspection.

June 2009 – Corps approves city’s Floodway Maintenance Deficiency Correction Plan.

October 2009 – Corps approves city’s Standing Wave feature as a Section 208 recreation project.

December 2009 – Corps approves construction of Margaret Hunt Hill Bridge.

August 2010 – Corps approves city’s construction of

the Pavaho Pump Station to improve interior drainage outside the levees in the West Dallas neighborhood.

September 2010 – City awards tree removal contract; groundbreaking held for Pavaho Pump Station.

November 2010 – U.S. Army Engineer Research and Development Center begins fully softened strength tests of Dallas Floodway, provides interim results starting in January to keep city’s 100-year Section 408 design moving. The city is working to recertify the levees for FEMA’s National Flood Insurance Program. Geotechnical work, with more than 5,000 borings, will provide a better understanding of Floodway soils.

July 2011 – The Corps determines that a new Risk Assessment process is necessary for the Dallas Floodway Project. Modeled on the Corps’ successful Risk Assessment for dams, it is the first significant levee system to undergo this process. It will be utilized for the Dallas Floodway Feasibility Study to determine requirements for upgrading the levee system.

1 Sept 2011 – City of Dallas and Corps teams meet with Corps’ Risk Management Center director to discuss applying Risk Assessment. It will evaluate probable failure modes and consequences of failure using “most likely” scenarios rather than standard criteria-based design assumptions.

31 October 2011 – Months-long Risk Assessment process begins.

21 February 2012 – Corps approves Section 408 application for city construction of 3.5 miles of cut-off walls along the East and West Levees to meet 100-year flood level of protection required under FEMA’s National Flood Insurance Program. The barrier blocks underwater seepage under the levee.

12 April 2012 – City completes remediation of all 198 operations and maintenance deficiencies identified in the periodic inspection conducted in December 2007.



Cut-off wall construction in 2012.

25 April 2012 – Corps approves Section 408 application for city construction of Baker Pump Station III expansion on East Levee near Sylvan designed to reduce neighborhood storm-water flooding in the Design District area.

11 June 2012 – Base Condition Risk Assessment report finds Dallas Floodway more resilient than earlier believed. Key findings: Major floods are likely to be short-duration events. Of 13 potential failure modes examined two were found to reach a significant level of risk and only during extreme events. The two are overtopping with breach of the East or West Levee and overtopping of the East Levee floodwall. Corps begins examining specific flood-risk reduction measures for the Dallas Floodway that consider life safety, economic damages and budget constraints.

4 September 2012 – Corps awards contract for Phase I construction on the Upper Chain of Wetlands in Dallas Floodway Extension Project. This preliminary step clears and seeds the Wetland Cell A footprint. Balance of Upper Chain construction awaits remediation of soils in Cells B and C footprint. Wetlands designed to offset floodwater conveyance to be lost when the Lamar Levee is built.

26 September 2012 – City issues notice to proceed for construction of Baker III Pump Station on East Levee.

December 2012 – Lamar Levee footprint geotechnical samplings and 35 percent design are complete.

Late December 2012 – Corps ecologists spot 6,500 birds, mostly ducks, at Lower Chain of Wetland Cells F&G following a flood. It is a sign the new habitat is successfully attracting migrating birds in significant numbers.

28 December 2012 – Corps begins winter planting of eight test plots to improve understanding of planting techniques needed in the Dallas Floodway Extension Project mitigation program. The National Environmental Policy Act requires an offset of plant loss from construction of the 3.7 mile-long chain of wetlands. Plantings will upgrade habitat of 1,179 nearby acres in the project area with a greater diversity of native plants to provide better cover and a greater and more dependable food supply for a wider range of wildlife.

14 January 2013 – Corps briefs Trinity River Corridor Committee on recommendations for flood-risk management actions in Dallas Floodway Project. Key takeaways: 1. Modify abandoned AT&SF Bridge to remove earthen embankments and piers that collect debris and back up floodwaters; historic trestle structure, some wooden piers and Santa Fe Trestle Trail will remain. 2. Raise low spots along 9.3 miles of levees up to 3 feet to increase flood conveyance to a standard of 277,000 cubic feet per second. This is sufficient to convey floodwaters from a Standard Project Flood that has a one in 2,500 chance of happening in any given year. Construction cost of these two actions is estimated at \$9.7 million in 2014 dollars.

March 2013 – U.S. Army Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility reports increasing diversity in the Lower Chain of Wetlands. Increasing annual species counts of birds, fish, reptiles, amphibians and macro-invertebrates seem to coincide with progress in the establishment and diversity of the aquatic vegetation in the Corps-managed ecosystem.

22 April 2013 – Corps completes Cell A Upper Chain of Wetlands Phase I construction.

May 2013 – City completes cut-off wall construction along East and West Levees, part of its effort to recertify the Floodway to regain accreditation from FEMA.

August 2013 – Species tally by Audubon Texas' Trinity Bird Count reaches 125 in the Lower Chain of Wetlands – among the highest of seven areas checked by the

organization each quarter since 2011.

9 August 2013 – Corps approves Section 408 application for I-30/I-35E Horseshoe bridges in Dallas.

23 October 2013 – Corps approves Section 408 application to build a seepage cut-off wall along the East Levee near Cadiz Pump Station as part of East Bank/West Bank Tunnel Interceptor Connection to construct two sewer pipelines in the Dallas Floodway.

