

United States Flood Loss Report - Water Year 2012

Executive Summary

Direct flood damages during Water Year 2012 (October 1st 2011-September 30th 2012) totaled \$0.50 billion. This damage total is only 6% of the thirty-year average (1982 - 2011) of \$8.20 billion (adjusted to 2012 inflation). There were 34 flood-related deaths (36% of the 30-year average of 95). Of these fatalities, 25 were vehicle related incidents, and 24 were attributed to flash flood events.

As Water Year 2012 brought heat and drought to most of the nation, it also brought an abrupt reversal to the record-breaking flood damages recorded in 2011. A quick and uneventful spring snowmelt was followed by a weak convective rainfall season and three land-falling tropical cyclones, with limited freshwater flood impacts. The three tropical cyclones which made landfall in Water Year 2012 were Tropical Storm Beryl, Tropical Storm Debby, and Hurricane Isaac. These tropical storms produced one freshwater flood fatality and \$31 million in direct freshwater flood damages. These impacts are in stark contrast to Water Year 2011, where two tropical systems accounted for 37 freshwater flood fatalities and at least \$3.9 billion in direct freshwater flood damages. The Southwestern U.S. monsoon season produced flash flooding across Arizona, Colorado and Utah during late July and early August and again in September across California, Nevada and Utah. In total, the floods associated with the monsoon season caused \$73 million in damages and seven fatalities.

Other significant Water Year 2012 flood loss events include the: November 7, 2011 flash flood in Puerto Rico which caused eight fatalities; March 12, 2012 flood on the southern Louisiana coast which produced over \$160 million in damages; Southern U.S. spring floods in late March which caused 5 fatalities and \$12 million in damages; June 20, 2012 flood in Minnesota and Wisconsin which caused \$65 million in damages; and the September 19-24 flood event in Alaska which caused \$23 million in damages and one fatality.

See below for detailed summaries and associated flood losses for the most significant events during Water Year 2012. Additionally, a table of all flood losses by state is provided.

NWS Role in Flood Loss Statistics

There is no one agency in the United States with specific responsibility for collecting and evaluating detailed flood loss information. The National Weather Service (NWS), through its many field offices, provides loss estimates for significant flooding events. However, this task is ancillary to the primary focus of

the NWS, providing forecasts and warnings for events that lead to death and damage. Therefore, the estimates provided here should only be considered approximations¹.

This report provides a summary of *direct flood damages*, which account for damage to (a) private property, including structural damage and lost agriculture; and (b) public infrastructure and facilities. Flood loss estimates reported by other entities, such as media, insurance, or other governmental agencies often include additional *indirect* flood-related costs such as (a) mitigation costs (e.g., sandbagging, temporary levees, and temporary shelters); and (b) projected estimates of economic loss (e.g., disruption to planting and harvesting, lost wages, disruption to transportation, interruption to commerce due to closed facilities, and reduction in tourism). Typically, flood loss estimates which include indirect costs are much larger than the direct flood damage estimates reported here.

It is also important to note this report concerns itself only with freshwater flooding, and does not account for coastal flooding related to cyclone-related storm surge. An example of this distinction is Hurricane Katrina in 2005, where the majority of flood deaths were caused by storm surge. In this case impacts were categorized separately from freshwater flooding (caused by significant rainfall and/or snow melt, dam or levee failures, and ice jams). Storm surge death and damages are not included in this report.

Detailed Major Events Summary

1. Tropical Cyclones May-Sep, 2012 (1 fatality, \$31 million)

Hurricane season brought limited freshwater flooding to the continental U.S. in Water Year 2012. Three tropical cyclones made landfall: Tropical Storm Beryl (May 26-30, \$0.2 million in damages, no fatalities), Tropical Storm Debby (June 23 - 27, \$14 million in damages, one fatality) and Hurricane Isaac (August 21 - September 1, \$17.5 million in damages, no fatalities). These storms show the stark contrast to Water Year 2011, where two tropical systems accounted for 37 freshwater flood fatalities and at least \$3.9 billion in direct freshwater flood damages.

1.1. Tropical Storm Beryl May 26-30, 2012 (\$0.2 million)

Tropical Storm Beryl was a pre-season tropical storm that made landfall in northeastern Florida on May 26, 2012 and subsequently affected portions of the southeastern United States through May 30th. Beryl produced rainfall totals of 3-7 inches from northeastern Florida to eastern North Carolina, with

¹ Pielke, Jr., R.A., M.W. Downton, and J.Z. Barnard Miller, 2002: *Flood Damage in the United States, 1926-2000: A Reanalysis of National Weather Service Estimates*. Boulder, CO: UCAR.

an isolated area in excess of 10 inches over northern Florida. The rain caused minor inland flooding, tallying less than \$200,000 in freshwater flood damages.

1.2. Tropical Storm Debby June 23 -27, 2012 (1 fatality, \$14 million)

Tropical Storm Debby was a large tropical storm that formed in the south-central Gulf of Mexico and made landfall on June 23, 2012 in the Florida Big Bend region. Debby produced two days of torrential rains with widespread rainfall totals greater than 10 inches over the west-central Florida coast north of Tampa to the eastern Florida Panhandle and eastward to parts of northeastern Florida, with some locations recording over 20 inches of rain. This heavy rainfall led to flash flooding and river flooding throughout the area. Record river levels were set on the Sopchoppy River and the St. Mary's River at Macclenny, Florida. Flood levels along the Suwanee River were the highest observed since Hurricane Dora in 1964. Over 1000 homes were inundated and major damage was sustained to infrastructure, including roads and water management structures. A portion of U.S. Highway 90 was closed for nearly two weeks and Interstate 10 was closed for 2 days. Freshwater flooding associated with Tropical Storm Debby were responsible for \$14 million in direct damages and one death.

1.3. Hurricane Isaac August 21 - September 1, 2012 (\$17 million)

Isaac entered the Gulf of Mexico as a tropical storm on August 26, moving northwest after crossing Haiti, Cuba and the Florida Straits. The northern edge of the wind and rain area associated with Isaac affected the South Florida peninsula throughout the 26th and 27th. Rainfall amounts as high as 16 inches were measured in Royal Palm Beach and Loxahatchee, with estimates in excess of 18 inches in a two-day period. Moderate to severe flooding affected a large portion of metro Palm Beach County west of the Florida Turnpike. Hardest hit communities include The Acreage, Royal Palm Beach, Loxahatchee and Wellington. Canals were overtopped and communities were stranded by high water for several days after the rains stopped. Few homes suffered water damage, but major damage was sustained to infrastructure, including roads and water management structures.

Isaac strengthened into a hurricane on the morning of the 28th when it was 75 miles south southeast of the mouth of the Mississippi River and made landfall as a Category 1 Hurricane near the mouth of the Mississippi River on the evening of the 28th. A second landfall occurred near Port Fourchon, Louisiana the following morning. Persistent rainbands produced heavy rainfall over a three day period affecting coastal sections of south Mississippi. 10 to 20 inches of rainfall was common across the region. Heavy rainfall produced both flash flooding and later moderate to major river flooding. Record crests were observed

on the Wolf River near Landon, Louisiana (August 31) and Gulfport, Louisiana (September 1), and the East Hobolochitto Creek near Caesar, Louisiana (August 31).

In total, the freshwater floods of Isaac caused \$17 million in direct damages and no fatalities.

2. Southwestern US Monsoon Season July-Sep 2012 (7 fatalities, \$73 million)

Monsoon moisture over the desert southwest produced heavy showers, thunderstorms and flash flooding across Arizona, Colorado and Utah during late July and early August and again in September across California, Nevada and Utah. The impact of this heavy rainfall over such a short period of time is far worse over the Southwest, where desert soils are unable to absorb torrential rainfall. The first high impact monsoon event hit Arizona July 13-14th, with episodes of flash flooding in the Lake Havasu City, Arizona and Wickenburg, Arizona areas (between Las Vegas, Nevada and Phoenix, Arizona). Just two weeks later, another surge of monsoon moisture spread into the Southwest leading to more widespread flash floods from July 29-August 1. In the Phoenix, Arizona area, estimated rainfall rates were in excess of three inches per hour, including one measurement of over five inches of rain within 90 minutes. The July 29 - August 1 flash floods caused direct flood damages from Phoenix, Arizona to Southwestern Utah and as far east as Colorado Springs, Colorado. Two more events would follow and heavily impact the Las Vegas, Nevada area on August 22 and September 11. Throughout the monsoon season numerous roads were closed due to water, mud, and rock flows. Several people had to be rescued from vehicles, and other parked vehicles were submerged in muddy water. Many homes, condos, and businesses flooded, including the University of Nevada, Las Vegas campus and the MGM Grand Garden Arena. In total, the floods associated with Monsoon Season caused \$73 million in damages and seven fatalities.

3. Other Significant Flood Loss Events

3.1. Arecibo, Puerto Rico - November 7, 2011 (8 fatalities)

A low pressure system southwest of Bermuda brought an unstable air mass over Puerto Rico November 7, 2011. Afternoon showers and thunderstorms dropped over 6 inches of rain on the municipality of Arecibo, roughly 60 miles west of San Juan. A van with 10 inmates and two guards was overturned by a rush of water flowing down a normally dry streambed; eight of the inmates drowned. According to emergency management officials, the streambed had already flooded the nearby area before the van attempted to cross.

3.2. Lafayette, Louisiana - March 12, 2012 (\$164 million)

A frontal boundary pushed to the coast of Louisiana on March 11 and stalled through much of March 12. Storms along the front persistently

dropped heavy rain over areas north of Interstate 10 leaving some locations with over a foot of rain. High impact flash flooding was reported across southern portions of Saint Landry, **Louisiana** northern sections of Lafayette, **Louisiana** and northwest sections of Saint Martin, **Louisiana** parishes. Two thousand residents were impacted, as nearly 700 homes were damaged in the Carencro area, roughly 60 miles west of Baton Rouge, **Louisiana**. All told, the Louisiana floods of March 2012 caused approximate \$164 million in direct damages.

3.3. Southern US Spring Floods – March 20-24, 2012 (5 fatalities \$12 million)

A slow-moving upper level low pressure system produced 4 to 6 inches of rain, with isolated amounts up to 10 inches to the Deep South and Central Appalachians from March 20th through the 24th. These rains caused deadly flash flooding in Texas, Arkansas and Virginia. The first line of thunderstorms associated with the low, developed on March 20th, near the I-35 corridor of Texas. As the upper level low finally moved out of the Deep South, and over the Southern Appalachians, flooding redeveloped over Southern Virginia. Heavy rainfall of 2 to 4 inches in several hours caused flooding near Buckingham Virginia, near the North Carolina border. In total, the Southern U.S. Spring floods caused 5 fatalities and approximately \$12 million in direct damages.

3.4. Minnesota/Wisconsin – June 19-20, 2012 (\$65 million)

A cold front stalled across southern Minnesota and central Wisconsin on June 19th, resulting in strong thunderstorms that produced widespread 4 to 6 inches of rain with isolated 8 to 10 inches from Aitkin, Minnesota to Duluth, Minnesota and along the Minnesota Lake Superior shore to Two Harbors, Minnesota. Most of the rain fell during a 12-hour period from the evening of the 19th through the early morning of June 20th resulting in significant flash flooding. Numerous roads, bridges and sewer systems were impacted or washed out, especially in Duluth, Minnesota. The rain fell across the headwaters of 4 river basins. Communities along the Moose Horn Creek and Kettle River which flows south in the St Croix River, saw significant flooding as well as communities on the St Louis River including Carlton, Thompson, and Fond du Lac. The flooding in city of Thompson was due to Thompson Reservoir overtopping several structures that help contain the lake. This area had not seen such severe flooding since 1950. In total, \$65 million in direct damages was caused by this storm.

3.5. Alaska – September 19-24, 2012 (1 Fatality, \$23 million)

A series of strong storm systems hit South-central Alaska in mid-September. Each storm followed nearly the same track along the Alaska Peninsula then along the Bering Sea coast, resulting in flood damages over large areas. Storm total precipitation ranged from 21 to 27 inches

along the eastern Kenai Peninsula, and 6-12 inches further inland along the Talkeetna Mountains north to the headwaters of the Nenana River. A large number of roads and bridges were affected; damage to the Alaska Railroad shut down the rail service for several days. Almost 60 homes were either severely damaged or destroyed and over 700 other homes were either affected or sustained minor damage. Most of the damage occurred along the Little Susitna River and Willow Creek. In total, there was \$23 million in direct flood damages, and one fatality associated with the flooding.

State, Commonwealth or Territory	Damages (whole numbers)	Fatalities
Alabama	\$358,000	0
Alaska	\$23,430,000	1
American Samoa	\$0	0
Arizona	\$18,100,000	4
Arkansas	\$5,469,000	2
California	\$3,658,000	0
Colorado	\$15,635,000	0
Connecticut	\$35,000	0
Delaware	\$600,000	0
District of Columbia	\$0	0
Florida	\$27,770,000	1
Georgia	\$2,414,000	0
Hawaii	\$0	0
Idaho	\$5,687,700	0
Illinois	\$158,000	0
Indiana	\$54,500	0
Iowa	\$95,000	0
Kansas	\$300	1
Kentucky	\$898,000	1
Louisiana	\$176,029,000	0
Maine	\$700,000	0
Maryland	\$635,000	0
Massachusetts	\$8,888,000	0
Michigan	\$8,944,000	0
Minnesota	\$45,807,000	0
Mississippi	\$6,867,000	0
Missouri	\$132,000	0
Montana	\$50,000	0
Nebraska	\$1,506,000	0
Nevada	\$25,782,500	2
New Hampshire	\$3,185,000	0
New Jersey	\$290,000	0
New Mexico	\$272,500	0
New York	\$352,000	0
North Carolina	\$1,266,000	0
North Dakota	\$90,000	0
Ohio	\$1,422,000	1

Oklahoma	\$540,000	0
Oregon	\$20,250,000	2
Pennsylvania	\$1,425,000	0
Puerto Rico	\$755,000	11
Rhode Island	\$120,000	0
South Carolina	\$1,057,000	0
South Dakota	\$2,000,000	1
Tennessee	\$786,000	0
Texas	\$33,426,500	5
Utah	\$11,122,000	1
Vermont	\$925,000	0
Virginia	\$2,477,000	1
Washington	\$1,469,000	0
West Virginia	\$10,960,000	0
Wisconsin	\$21,670,000	0
Wyoming	\$20,000	0
TOTAL	\$495,583,000	34