

FLOOD DAMAGES SUFFERED IN THE UNITED STATES DURING WATER YEAR 2009

Flood damages during Water Year 2009 (October 2008-September 2009) totaled \$1 billion. This was 13% of the thirty year average (1979 - 2008) of \$7.69 billion (2009 dollars)*, which includes the catastrophic damages associated with Hurricane Katrina. Major events in Water Year 2009 included record flooding along the Red River of the North in the Dakotas and Minnesota in March and April; flooding in the Pacific Northwest during early January; flooding in late March and early May across the southern and central Plains due to slow moving storm system; near record spring ice breakup flooding in Alaska during May; three separate incidents of intense summer rainfall leading to substantial localized yet very destructive flooding in Wisconsin, Michigan and Kentucky; and catastrophic and deadly flooding across the Southeast in September. During Water Year 2009, there were 52 flood-related deaths, 53.5% of the thirty year average (1979-2008) of 95.4. This long-term average does not include the deaths from Hurricane Katrina, which have been determined to be hurricane related or attributable to other causes. The fatalities this year include 38 vehicle related incidents and 47 can be attributed to flash flooding incidents.

COMPILATION OF 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 mission of the NWS: *The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.* The NWS's focus is on predicting the events that lead to death and damage, not on an assessment of the consequences of the events it predicts. Therefore the estimates provided here should only be considered approximate.

SUMMARY OF MAJOR EVENTS

The Nation saw only a few major flooding events this year, the most significant being the spring flooding on the Red River of the North in the Dakotas and Minnesota and the catastrophic and deadly flooding across the Southeast at the end of the water year in September. There were several other high cost but smaller scale flooding events as well. Spring flooding in Alaska caused near record flooding across the interior of the state. High intensity storms bringing copious amounts of precipitation in short periods of time caused substantial damage in parts of the Pacific Northwest in January; Wisconsin and Michigan in June; and Kentucky in August. Two episodes of slow moving storm systems with repeated bouts of heavy rainfall which caused widespread flooding occurred across

the central and Southern Plains in April and the Southeast in September. The hurricane season was exceptionally quiet, with no significant inland flooding impact from any of the storms.

PACIFIC NORTHWEST: January 7 - 9, 2009

The first few days of the New Year saw a strong Pacific storm bring heavy rains of 3-5, up to 7.4, inches to parts of the Pacific Northwest. Up to 2 feet of snow fell in the Cascade Mountains. This caused major flooding on several rivers and several debris flows. While the flooding from this event receded quickly, it set the stage for subsequent flooding due to heavy rain from another powerful storm January 6-8.

Western Washington and northwestern Oregon had lowland precipitation ranging from 2 to 8 inches and from 8 to 17 inches in the mountains. Rivers and streams across this portion of the Pacific Northwest were driven above flood stage. A large number of large avalanches and debris flows occurred. All Cascade mountain passes were closed, with much of western Washington having no transportation access east across the Cascades or south to Portland. This flooding and debris flows caused \$68 million in damages with fortunately no flooding related deaths.

RED RIVER OF THE NORTH BASIN: March – April, 2009

During March and April of 2009, widespread river and areal flooding occurred over a large portion of the Dakotas and Minnesota. Copious precipitation during the previous fall (200-400% of normal), wet soils before winter freeze, substantial water in the snow pack, snowmelt and record precipitation (March 21-24) produced major flooding along the Red River of the North. The Red River at Fargo, ND crested at 40.84 feet on March 28, 2009. The previous record stage was 40.1 feet on April 7, 1897. A second crest of 34.0 feet occurred at Fargo on April 16, 2009. Flooding also occurred on tributaries of the Red River of the North, causing widespread flooding problems.

Heroic efforts made by local residents and emergency management agencies helped prevent much more damage than was observed. The flood prevention efforts enacted after the Red River flooding of 1997 also acted to reduce flooding related damage from this spring's flooding. It is very difficult to separate the value of the damages caused by the flooding from the cost of the entire massive flood fighting effort. These damages are currently estimated at \$55 million. Due to the well advertised and slow moving nature of this flooding, no flooding-related deaths were associated with this event.

CENTRAL, SOUTHERN PLAINS: April 27 – 30, 2009

A large, very slow moving storm system dropped copious amounts of rain across portions of Texas, Oklahoma, Kansas and Missouri from April 26 through 30. This took the form of thunderstorms throughout the first half of the week. A swath of 6 to 10 inches of rain

was reported along extreme northern Texas and southern Oklahoma, with locally greater amounts. Central Texas saw 5 to 6 inches and 7 to 12 inches fell across areas west and north of Houston. This produced widespread flooding across the Red River Valley between Oklahoma and Texas. Intense rainfall from thunderstorms also occurred on the 27th across Kansas and Missouri, totaling up to 4 inches. This created substantial flash flooding in the region.

Damages from this event totaled \$42.9 million. \$15 million of this was in the Houston area, where over 2,100 homes had flooding damage, the 4th largest number of homes flooded in a single event for Harris County. Unfortunately 5 persons perished in this flooding; 2 in Texas and 3 in Kansas, all of them vehicle related.

ALASKA: May 3 - 14, 2009

During the spring snow melt in Alaska, the ice on rivers break up and flow downstream. Ice jams can form which cause flooding in the local area. In May, a very significant ice jam formed on the Yukon River at Eagle, causing the worst flooding in recorded history. The old village of Eagle and portions of the town were entirely destroyed. Further downstream during this flooding, at the village of Tanana the Yukon River reached the highest level in over 50 years. Substantial ice jam flooding also occurred on several other rivers including the Kuskokwim and Chistochina Rivers. This flooding affected communities downstream of the major jams. There were numerous evacuations, flooded roads and train tracks, and bridges as well as power outages. Flooding was widespread across interior Alaska through to the middle of the month, when the breakup front had moved through much of the rivers and snow melt water was slowly draining from the tundra.

This widespread flooding caused \$29 million worth of damage to homes, public building and infrastructure, with fortunately no loss of life.

WISCONSIN: June 18 - 19, 2009

A series of thunderstorms moved across Southern Wisconsin beginning the evening of June 18th and lasting through the evening of the 19th. These thunderstorms dumped very heavy rain over a relatively short period of time with each round of storms. The result was flash flooding, especially in metropolitan areas of Milwaukee, and some river flooding. From 4 to 5 inches of rain fell with as much as 7 inches in some local areas resulting in damaging flooding.

There was widespread road damage, homes flooded, and flooding damages to businesses and public buildings. The city of Milwaukee sewer system was overwhelmed. High waters on the Menomonee River just east of the Milwaukee Brewer's Miller Park resulted in an earthen berm being washed away. The flood waters extensively flooded parts of

Miller Park, causing millions in damages. The total damages from this event are estimated at \$25.6 million, with no loss of life.

MICHIGAN: June 19 - 20, 2009

Significant flash flooding occurred June 19 in Ottawa and Allegan counties. Rainfall totaled 5 to 8 inches, with the bulk of this falling within a few hours. This inundation caused widespread flash flooding, particularly in the city of Holland. Roads were completely washed out, hundreds of homes were flooded, and many public structures including Hope College and the Holland Armory. Both Ottawa and Allegan counties declared a local state of emergency. Ottawa County was hardest hit, with substantial flood damage to public and private structures. Allegan County reported somewhat lesser flood damages, with an event total of \$41.3 million. There were no flooding related deaths associated with this event.

KENTUCKY: August 4, 2009

Record breaking heavy rains fell in an area of Kentucky centered on Louisville as well as extending into parts of Indiana. This was a local event, where locations 20 miles from Louisville to the west, south or east did not receive flash flood producing rains. Rainfall amounts up to 6 inches fell between 7 a.m. and 10 a.m. EDT in Louisville, KY. Five inches of rain fell in 90 minutes from 7:45 a.m. to 9:15 a.m. in one location in Louisville. Rainfall rates up to 8.8 inches per hour were reported.

Massive flooding was reported in parts of Louisville, KY, downtown New Albany, IN and flooding extended into Jeffersonville, IN. Water was several feet deep, with widespread water rescues. Numerous vehicles were totaled or sustained damage. The main library in downtown Louisville was flooded; nine buildings on the University of Louisville campus were damaged; the Derby Museum at Churchill Downs was flooded; over 40 Jefferson County public schools and 30 other public buildings were damaged. The damage total reached \$45.3 million, with no lives lost.

SOUTHEAST: September 18 - 23, 2009

Extreme to catastrophic flooding occurred across northern Georgia, northern Alabama, southeastern Tennessee, South Carolina and extreme southwestern North Carolina from September 18–23, 2009. Eleven people lost their lives, and property damage exceeded \$250 million. A stationary frontal boundary stretched from North Carolina across Tennessee, down through southeastern Arkansas into Louisiana for many days. A combination of moist southeast flow from the Atlantic in the lower levels, moist southwest flow above that from the Gulf of Mexico, and upslope rainfall enhancement helped bring heavy rains to the affected area over multiple days. Between 10-20 inches of rain was observed in less than 24 hours between September 20-21, 2009.

Thunderstorms brought intense rainfall, initially resulting in flash flooding, and eventually headwater and main stem river flooding. Numerous record flood levels were set, with some river flooding exceeding the expected 0.2% annual recurrence.

The worst flooding occurred in the western and northeastern suburbs of metropolitan Atlanta, including portions of Douglas, Cobb, Paulding, Carroll, and Gwinnett counties. All 11 fatalities were attributed to flash flooding and areal flooding. Ten of those fatalities occurred at night. Nine deaths were a result of people driving vehicles across flooded roads in poor visibility conditions due to heavy rain.

*Note: This average is determined by first adjusting previous year's damage totals by the Construction Cost Index.

FLOOD DAMAGES		
Water Year FY 2009 (nr = none reported)		
LOCATION	LIVES LOST	TOTAL DAMAGES SUFFERED (Thousands of dollars)
ALABAMA	3	11,831
ALASKA		28,770
ARIZONA		3,458
ARKANSAS	4	17,560
CALIFORNIA	1	1,905
COLORADO		926
CONNECTICUT		2,156
DELAWARE		nr
FLORIDA	2	73,013
GEORGIA	10	256,810
GUAM		nr

FLOOD DAMAGES

Water Year FY 2009

(nr = none reported)

LOCATION	LIVES LOST	TOTAL DAMAGES SUFFERED (Thousands of dollars)
HAWAII		5,267
IDAHO	1	1,553
ILLINOIS	3	10,023
INDIANA		8,100
IOWA		18,627
KANSAS	4	9,501
KENTUCKY	1	47,691
LOUISIANA		1,744
MAINE		3,021
MARYLAND AND DISTRICT OF COLUMBIA		370
MASSACHUSETTS		355
MICHIGAN		48,725
MINNESOTA		3,903
MISSISSIPPI	1	9,576
MISSOURI	1	995
MONTANA		23
NEBRASKA		622
NEVADA		35
NEW HAMPSHIRE		920

FLOOD DAMAGES

Water Year FY 2009

(nr = none reported)

LOCATION	LIVES LOST	TOTAL DAMAGES SUFFERED (Thousands of dollars)
NEW JERSEY		5,290
NEW MEXICO	1	813
NEW YORK	1	96,306
NORTH CAROLINA	2	6,873
NORTH DAKOTA		76,520
OHIO	1	4,651
OKLAHOMA	1	825
OREGON	1	4,125
PENNSYLVANIA		32,945
PUERTO RICO AND VIRGIN ISLANDS	1	225
RHODE ISLAND		107
SOUTH CAROLINA		434
SOUTH DAKOTA		1,075
TENNESSEE	3	11,801
TEXAS	10	43,097
UTAH		200
VERMONT		528
VIRGINIA		1,363
WASHINGTON		69,309

FLOOD DAMAGES

Water Year FY 2009

(nr = none reported)

LOCATION	LIVES LOST	TOTAL DAMAGES SUFFERED (Thousands of dollars)
WEST VIRGINIA		41,816
WISCONSIN		28,636
WYOMING		5,607
America Samoa		nr
TOTAL	51	1,000,026