

Flood 2011

Plus a Quick Hydrology Review

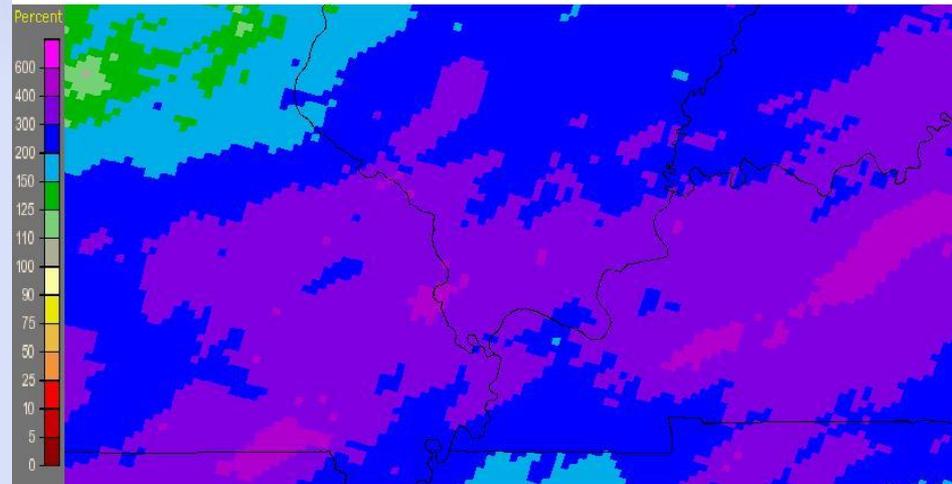
Winter Weather Workshop
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Flood of 2011 – The Rain

- At Paducah, 15.91 inches of rain fell in April. This was 10.96 inches above normal and set the record for the wettest April on record. It was not only the wettest April on record but the wettest month ever recorded for the Paducah area. Paducah also had the wettest season (March-May) on record with 31.21 inches of rain falling during the 3 month period (this is 63% of the normal annual rainfall).

Paducah, KY (PAH): April, 2011 Monthly Percent of Normal Precipitation
Valid at 5/1/2011 1200 UTC- Created 7/6/11 15:27 UTC



Flood of 2011

- ❑ Between April 17 and 28, our weather was dominated by a nearly stationary boundary and the numerous storm systems that moved along it and outflow boundaries. Rain amounts during this time were generally between 8 and 12 inches. There were several sites that received between 15 and 17 inches.
- ❑ Facing another round of heavy rain, WFO Paducah held a press conference Sunday evening, April 24.
- ❑ Press conferences are only held in advance of or during extreme events.
- ❑ Between 9 and 22 inches of rain fell across the region between April 22 and May 3.

Flood of 2011

April

- 3 Hydrologic Outlooks (for heavy rain potential)
- 16 Flash Flood Watches
- 48 Flash Flood Warnings (for 430 counties)
- 47 Flash Flood Statements
- 9 Flash Flood Warnings for Levee Breaches/Failures
- 4 Flash Flood Statements for Levee Breaches/Failures
- 2 Flood Warnings (for 60 counties)
- 1 Flood Statement (as followup to Areal Flood Warnings)
- 9 County Warning Area-wide Areal Flood Warnings
- 3 Flood Statements (as followup to CWA-wide Areal Flood Warnings)
- 2 Flood Warnings for Area Lakes
- 2 Flood Statements (as followup to Area Lakes Flood Warnings)
- 1 Special Weather Statement for Barkley and Kentucky Dam Operations
- 31 Urban and Small Stream Flood Advisories
- 51 Flood Warnings (for 78 forecast points)
- 266 Flood Statements (as followup to River Flood Warnings)

May

- 2 Flash Flood Watches
- 8 Flash Flood Warnings (for 98 counties)
- 11 Flash Flood Statements
- 7 Flash Flood Warnings for Levee Breaches/Failures
- 5 Flash Flood Statements for Levee Breaches/Failures
- 6 Flash Flood Warnings for Uncontrolled Spill at Wappapello Dam
- 3 Flash Flood Statements for Uncontrolled Spill at Wappapello Dam
- 1 Flood Warning for Levee Failure
- 8 County Warning Area-wide Areal Flood Warnings
- 6 Flood Statements (as followup to CWA-wide Areal Flood Warnings)
- 8 Flood Warnings for Area Lakes
- 7 Flood Statements (as followup to Area Lakes Flood Warnings)
- 7 Flood Warnings for Clarks River Flooding
- 1 Flood Statement for Clarks River Flooding
- 1 Special Weather Statement for Barkley and Kentucky Dam Operations
- 4 Urban and Small Stream Flood Advisories
- 17 Flood Warnings (for 17 forecast points)
- 514 Flood Statements (as followup to River Flood Warnings)

Ohio River Location	Flood Stage	Unofficial April/May 2011	Unofficial March 2011	2005	1997	1937
Owensboro	40	46.30	43.60	N/A	49.00	54.80
Newburgh L/D	38	49.08	46.98	46.81	50.53	56.60
Evansville	42	46.78	44.20	44.14	47.52	53.75
Mount Vernon	35	51.80	46.10	47.20	50.00	59.21
JT Myers L/D	37	56.94	49.51	51.21	53.84	64.40
Shawneetown	40	56.35	49.66	52.00	54.40	65.64
Golconda	33	56.89	48.68	50.55	53.58	62.60
Smithland L/D	40	54.89*	46.70	47.2	51.44	N/A
Paducah	39	55.03	47.81	47.90	51.79	60.60
Brookport L/D	37	51.00	49.50	49.50	53.60	62.30
Grand Chain L/D	42	62.20	54.80	54.60	57.80	64.00
Cairo	40	61.72*	53.41	53.20	56.20	59.50

* Unofficial New Record Stage

Flood of 2011

- ❑ Other record crests were, preliminarily, set at New Madrid on the Mississippi River, Princeton on the Patoka River, and both Plumfield and Murphysboro on the Big Muddy River.

The Biggest Challenge?

- Getting real-time and post-flood information.
 - Levee Breaches!!!
 - Evacuations
 - Water Rescues
 - Major road closures (anything extremely out of the ordinary with major impact)
- (The above would be used to enhance our warnings and statements and add value.)
- Preliminary damage estimates to homes and infrastructure. We're not FEMA. We're not picky.

Dam/Levee Failures

- ❑ If you have an Emergency Action Plan for a dam or levee in your county, please be sure that the National Weather Service is part of your call down list. We can promptly issue any watches or warnings necessary to assist in public notification. Warnings will automatically be tone-alarmed on NOAA Weather Radio.
- ❑ If you don't have an EAP and a dam or levee fails, please be sure that we are notified so, again, an appropriate product can be issued to warn/inform the public.

“Flash Flood Emergency”

- ❑ “In exceedingly rare situations, when a severe threat to human life and catastrophic damage from a flash flood is imminent or ongoing...”
- ❑ The National Weather Service can use this wording when reliable sources provide clear evidence that people have been placed in life-threatening situations by rapidly rising floodwaters.
- ❑ This information must come from a county/city official – sheriff’s office, emergency management, police dept, fire dept, etc.
- ❑ Can be used for widespread flooding, numerous evacuations and water rescues, dam/levee breaks. It can be used anytime that heightened attention needs to be given to a flood situation.

Turn Around, Don't Drown



The Federal Highway Administration has approved the **Flooding Ahead Don't Drown** sign as an official Incident Road Sign. For details on producing this FHA sign, go to http://weather.gov/os/water/tadd/TADDroad_sign.pdf

The following are the requirements for the sign:

Color: The official RGB background color is 255:40:140 or Pantone 232

Size: 24" x 36"

For the full FHA document on all sign specifications, go to <http://mutcd.fhwa.dot.gov/SHSE/warning.pdf>

Select: W11-12p in the bar on the left



The **When Flooded, Turn Around Don't Drown**, is compliant with the Federal Highway Administration's regulations and can be produced and deployed as an official road sign. For details on producing this sign, refer to

<http://mutcd.fhwa.dot.gov/SHSm/warning.pdf>

Select W8-13 in the left bar.

This sign serves as a valuable and life-saving compliment to our mutually developed FHWA-sanctioned TADD Incident Sign. This Warning Sign should be deployed at locations where the incidence of flooding is high, the onset of flooding is rapid, and/or where flooding occurs in isolated locations.

A Refresher Course

(And hopefully some new information along
the way.)

Barkley and Kentucky Lakes

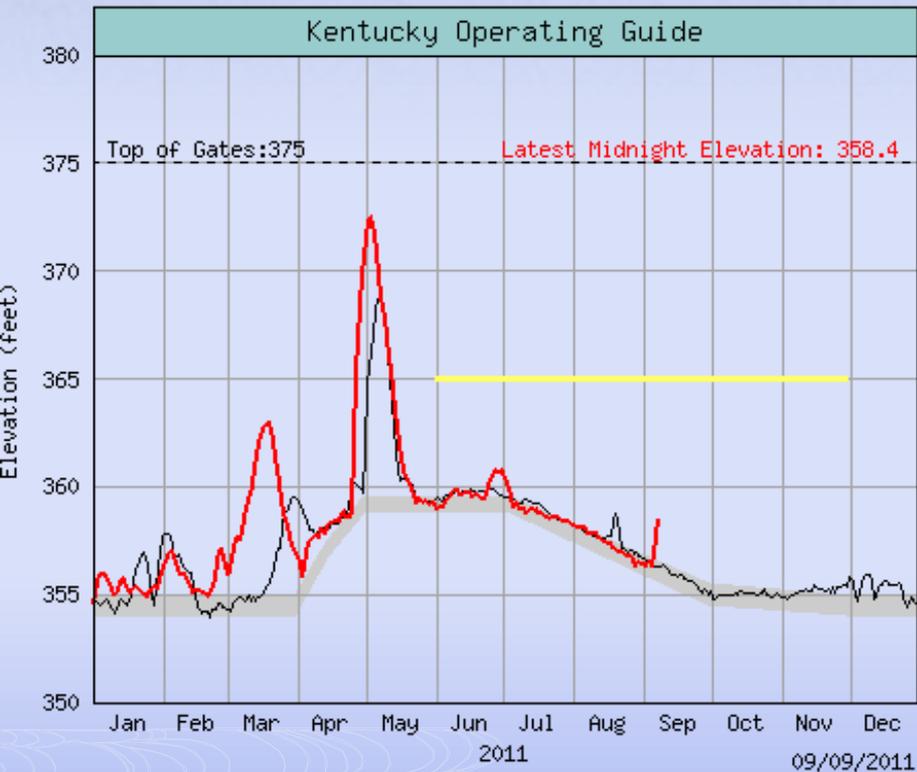


Kentucky Dam creates the largest manmade lake in the eastern United States. At maximum normal operating level, Kentucky Lake covers 160,300 acres.

While both lakes serve many uses, they were built for one main purpose – flood control.

Combined, both lakes help to lower flood crests in the lower Ohio and Mississippi Valleys.

Barkley and Kentucky Lakes



- Normal operating levels at both lakes during the winter is around 354 feet. Normal pool during summer is around 359.5 feet.
- This past May saw record pool levels at both lakes reaching 372.5 feet.

Lake Operations



May 3, 2011

- Normally, the Corps of Engineers coordinates releases from Barkley Dam with TVA, who regulates Kentucky Dam. When Cairo reaches 35 feet and is forecast to meet or exceed 40 feet, the Corps of Engineers takes over operational releases at both lakes.
- Releases are scheduled to minimize and control flooding on the lower Ohio River.

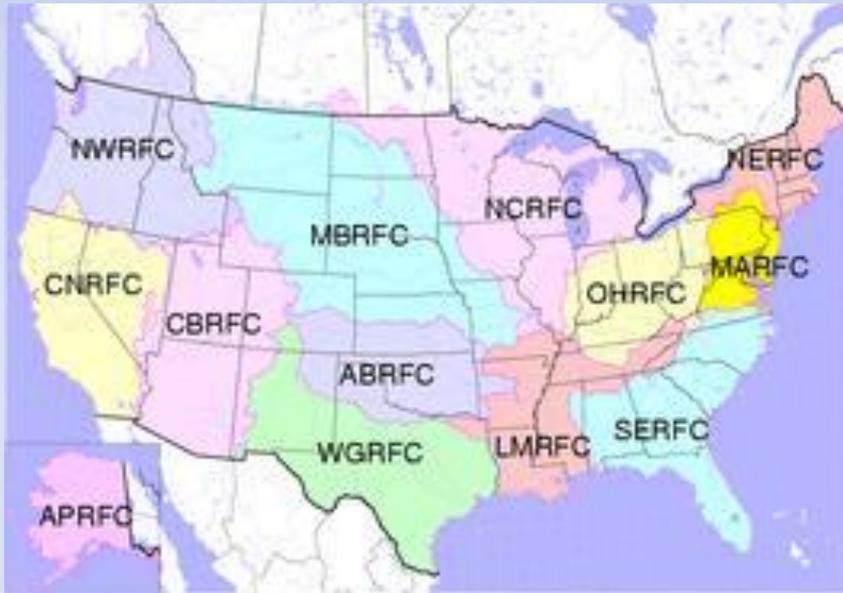
Lake Operations

- ❑ The lakes will release extra water in advance of a crest coming down the Ohio River. You will see the river come up faster below Smithland and crest earlier than say, up around J.T. Myers Lock and Dam.
- ❑ The Corps of Engineers will release enough water so that when the crest is occurring on the lower Ohio, the lakes can minimize their releases and not add to the high water.
- ❑ They will also release water if heavy rain is expected upstream in the Cumberland and Tennessee Valleys. If heavy rain falls, they need to have the storage space so that they aren't stuck with such high releases out of the dams. An example of an event that occurred too quickly to plan ahead was in May of 2010. So much rain fell in the Nashville area that when it finally made it to Lake Barkley, they had to release it fast and ended up with record releases that flooded many homes downstream.
- ❑ It is a delicate balance of flood control, operational guidelines and controlled releases.

River Forecasting

- Weather Forecast Offices (WFO), like the one in Paducah, work with the River Forecast Centers (RFC) daily to disseminate river forecasts and any flood warnings and statements as necessary.

River Forecast Centers



- The National Weather Service has 13 River Forecast Centers that serve the country.
- Our region is served by 3 of them, the North Central River Forecast Center (NCRFC), the Lower Mississippi River Forecast Center (LMRFC) and the Ohio River Forecast Center (OHRFC).
- They each create daily forecasts for hundreds of river forecast points found along the Mississippi and Ohio Rivers and their tributaries.

River Forecasting

- ❑ The forecast office will collect and quality control river gauge and precipitation data each morning and ensure the best data gets to the river forecast center.
- ❑ The river forecast center combines this data with radar estimates (plus a certain amount of forecasted rainfall) and runs the hydrologic model. In addition to coordinating with other river forecast centers, the coordinate with TVA and the Army Corps of Engineers regarding planned releases and changes for dams along the river and at reservoirs found throughout the basin.

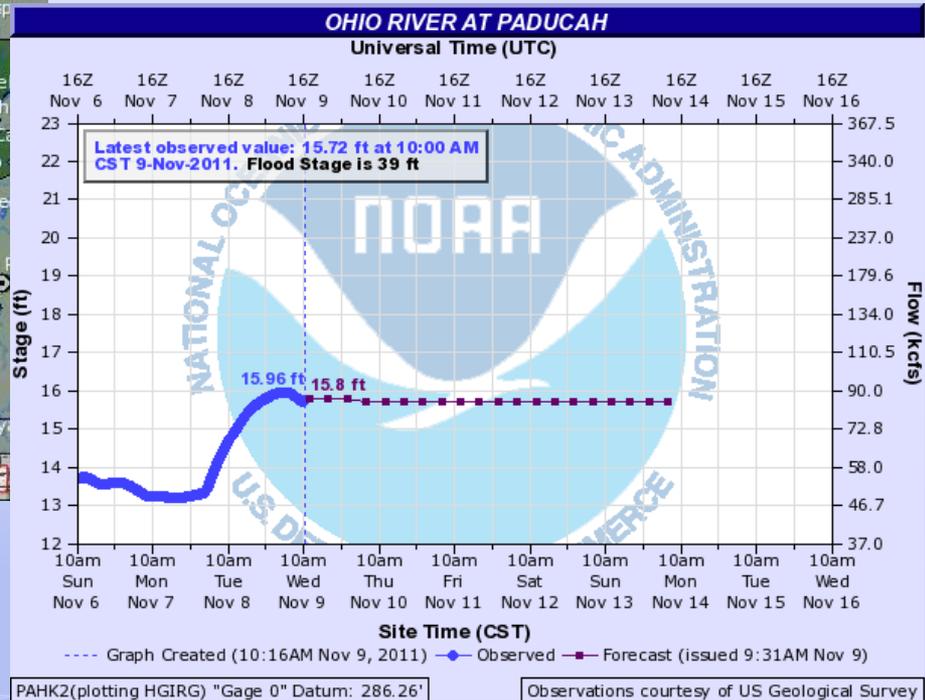
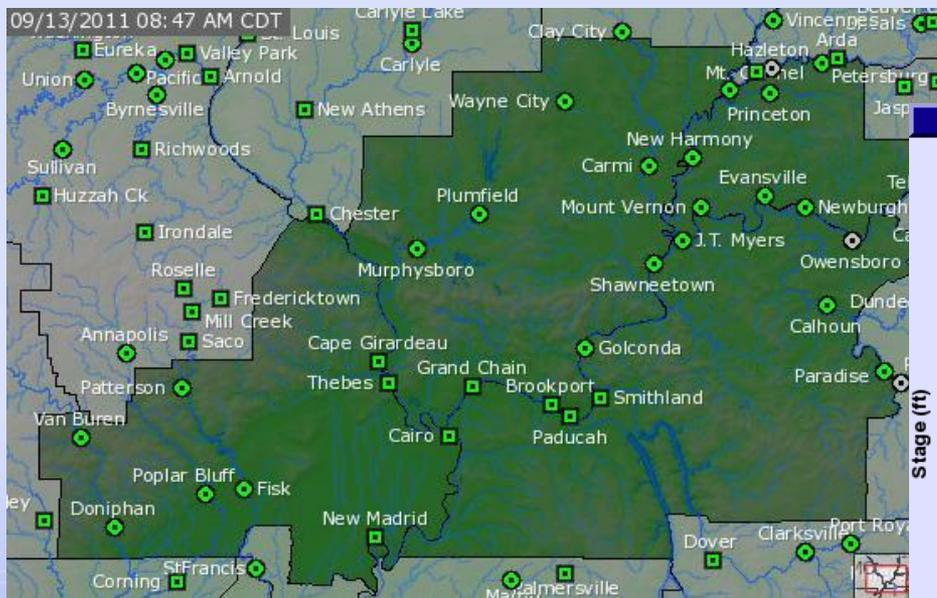
River Forecasting

- ❑ Hydrologic models estimate the amount of runoff a rain event will generate, compute the routing, how the water will move downstream from one forecast point to the next, and predict the flow of water at a given forecast point throughout the forecast period.
- ❑ The river forecast centers issue these forecasts back to the weather forecast offices.
- ❑ The weather forecast offices issue products to the public with river forecasts and evaluate the need for any river flood warnings and statements.

AHPS

- Advanced Hydrologic Prediction Service is a graphical interface for river forecasts and other pertinent gauge data.

Flood Categories, a map, flood impacts and photos are also included.



During Flooding

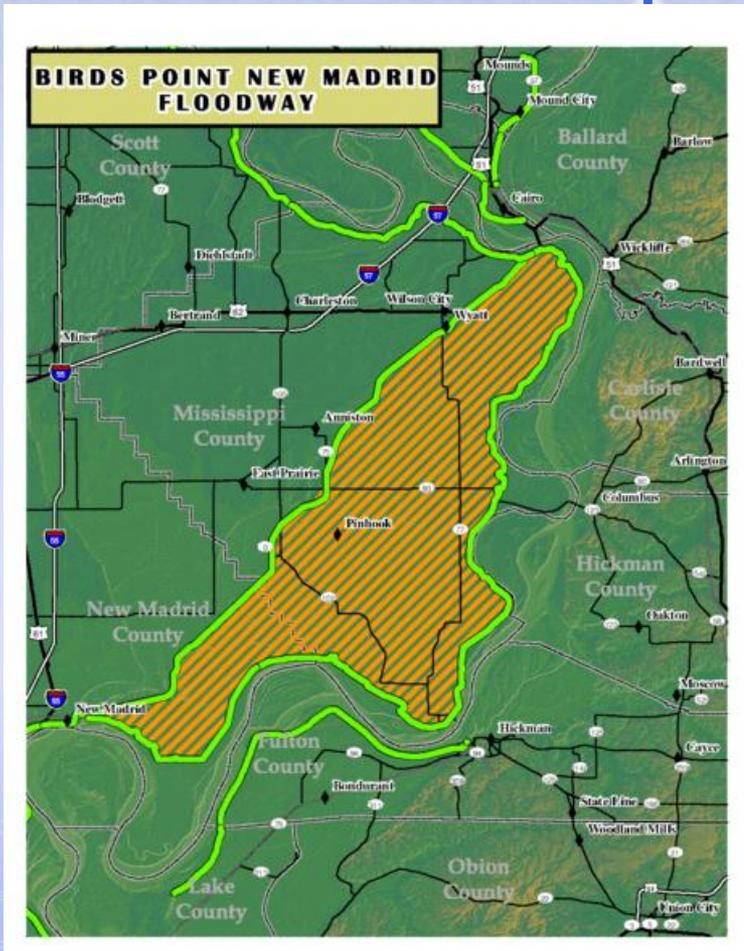
- ❑ When there is flooding, coordination kicks into overdrive. It becomes imperative that all agencies are on board with the latest flows, forecasted flows, reservoir releases and anticipated changes in the weather.
- ❑ There were specific daily calls this past spring involving the National Weather Service and the Corps of Engineers in our region. Meteorologists would give a precipitation briefing of what had fallen and what was forecast. The River Forecast Centers would discuss current flows and both operational and contingency forecasts (based on extended forecasted precipitation).

During Flooding

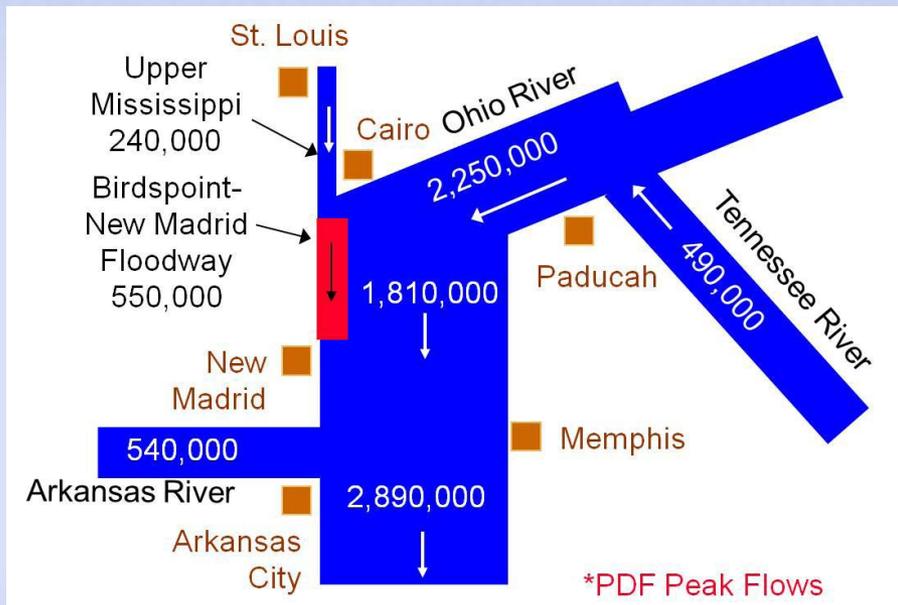
- ❑ The Corps' district offices would then give a briefing on operations. The division offices would then talk about coordinated reservoir operations and releases and any special operations.
- ❑ These calls kept all of the major players informed and were absolutely necessary to serving both public and private sector interests across the region.

An Exceptional Flood Requires Exceptional Measures

- The Birds Point-New Madrid Floodway is a flood control component of the Mississippi River and Tributaries Project, authorized by the Flood Control Act of 1928. Its purpose is to divert water from the Mississippi River during major flood events and to lower flood stages upstream and protect the levee system.

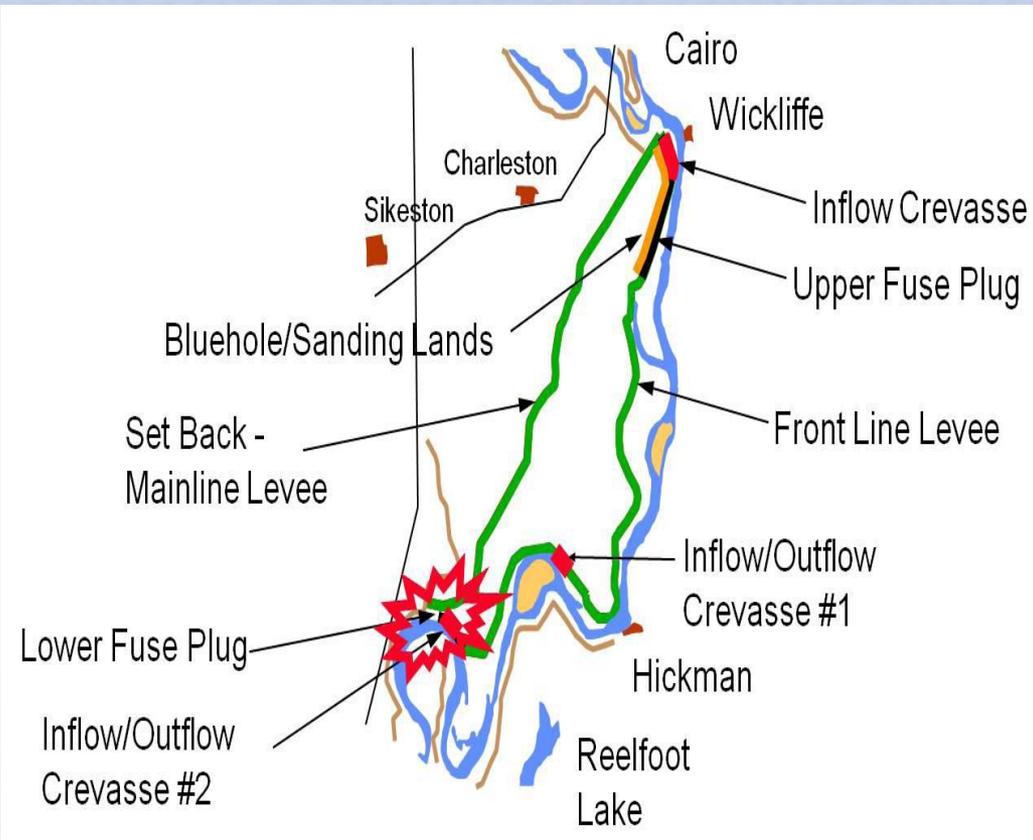


Birds Point – New Madrid Floodway



- During the Project Design Flood (or pretty much the worst case scenario), the floodway can divert 550,000 cubic feet per second from the Mississippi River.
- Since the project does not have floodgates like Morganza or Bonnet Carre, operation of the floodway is a controlled destruction of the frontline levee by overtopping or explosives.

Birds Point – New Madrid Floodway



- The floodway may be operated through explosives detonation only at the upper fuse plug section when stages at Cairo reach 58 feet and are forecast to exceed 60 feet.

Birds Point – New Madrid Floodway

- The floodway has only been activated twice – the first time during the 1937 Flood and again this year, 2011.



April 29, 2011

On May 2, the gauge at Cairo was over 61.5 feet. The floodway was activated the evening of May 2, 2011.



May 4, 2011

Any Questions?