U.S. Fish & Wildlife Service

Characterization of Lands Inundated by the Flood Event of 2011

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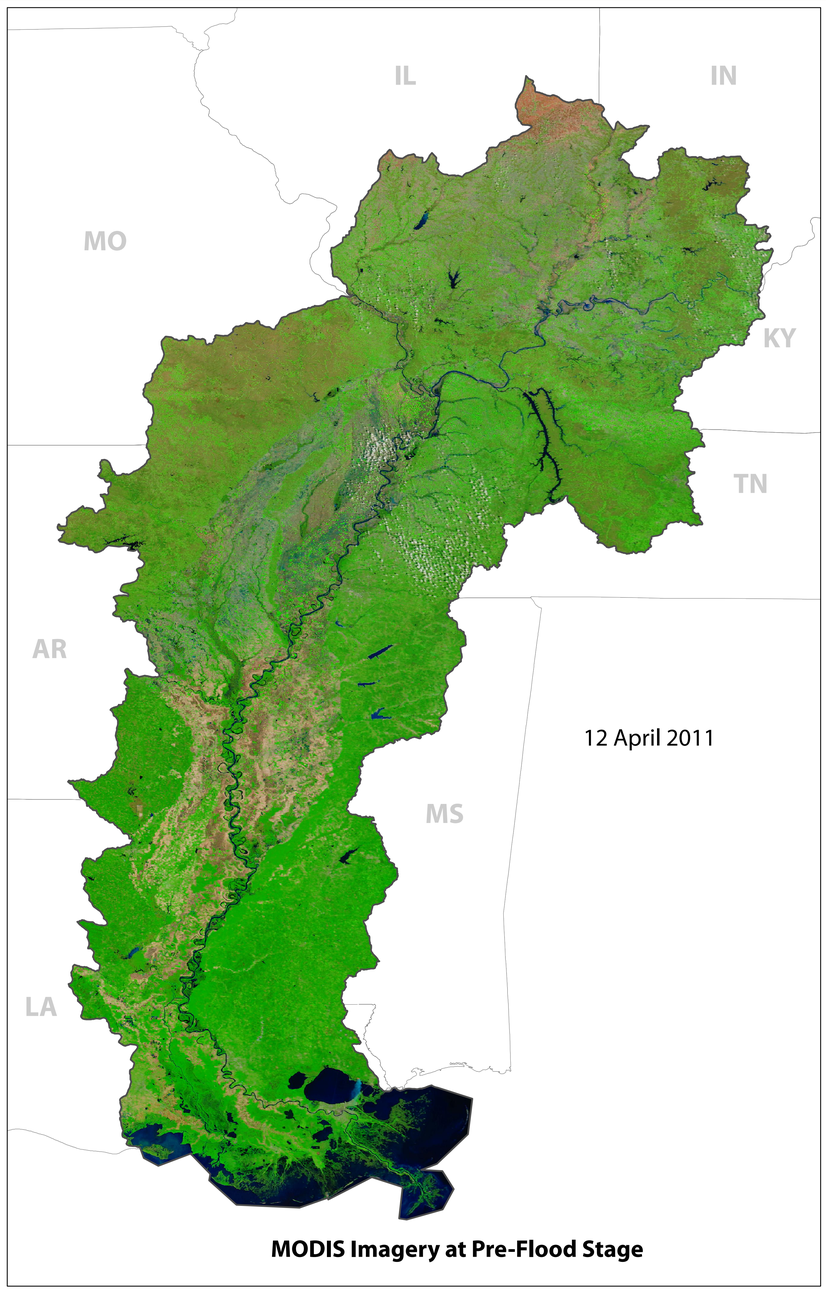
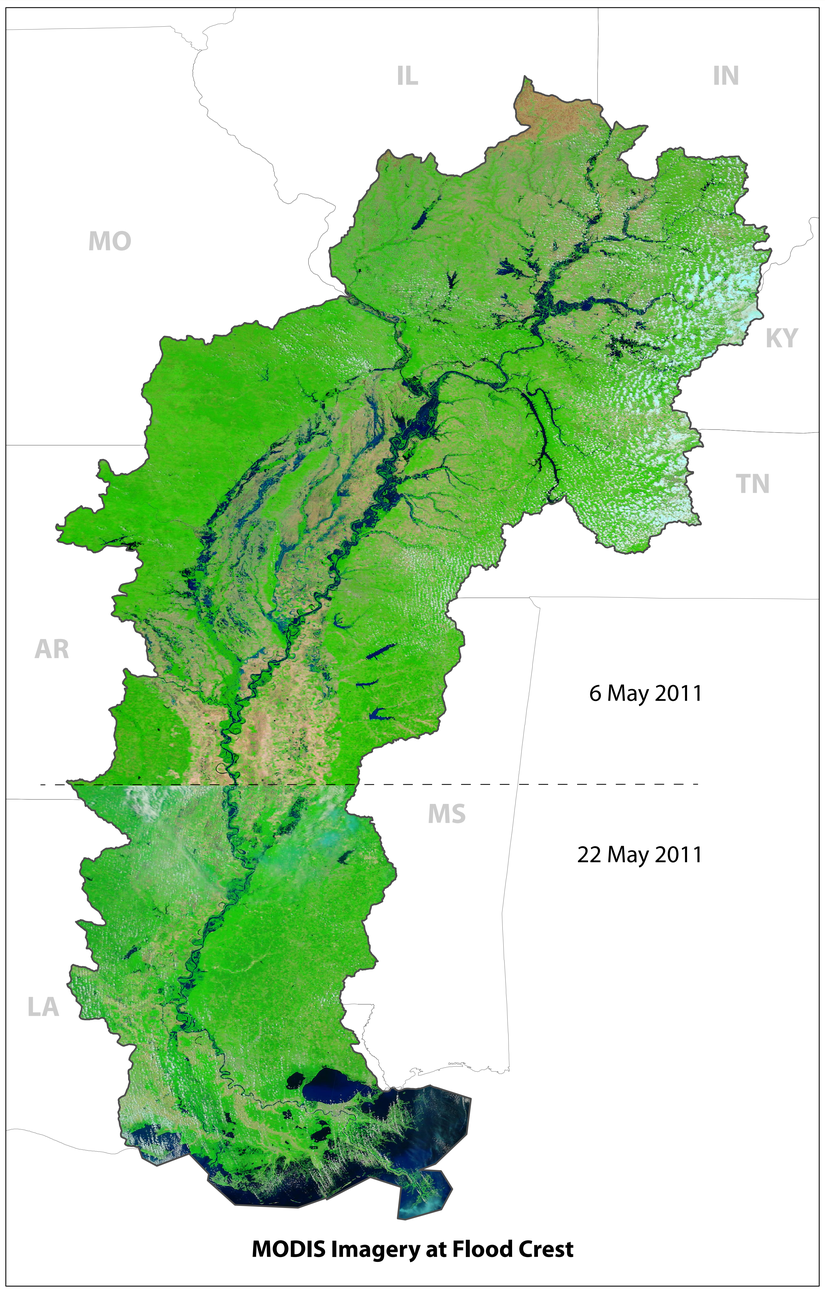
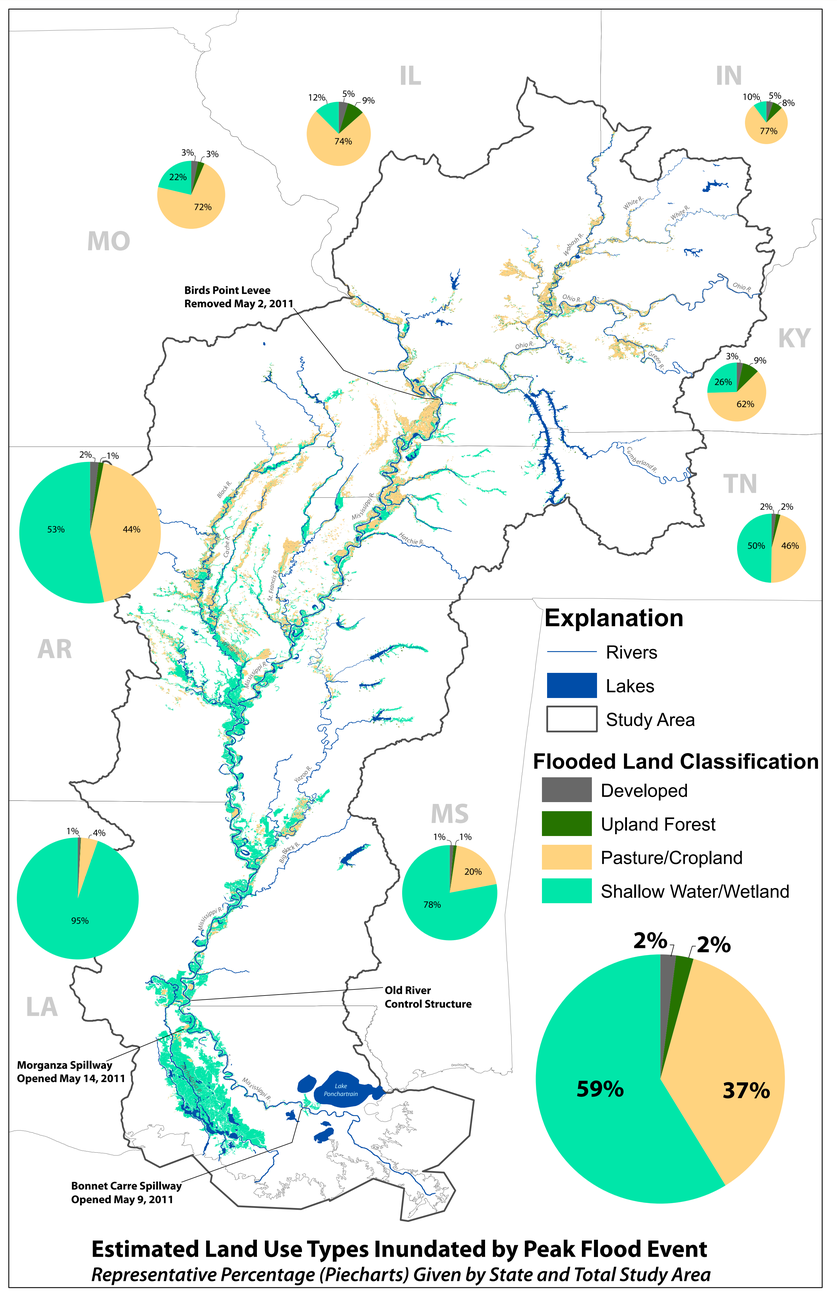


MODIS Imagery at Pre-Flood Stage



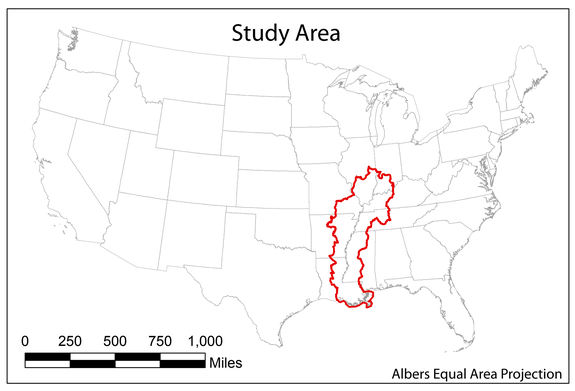
MODIS Imagery at Flood Crest



Estimated Land Use Types Inundated by Peak Flood Event

Representative Percentage (Piecharts) Given by State and Total Study Area

0 100 200 300 400 Miles



In April and May of 2011, flooding inundated lands along the Ohio and Lower Mississippi Rivers. Flood levels along portions of the Mississippi River peaked at the highest levels since 1937. An analysis of the extent of flooding was determined by the comparison of MODIS[1] imagery between pre-flood and flood crest conditions. National Land Cover Data (NLCD 2006) was used to determine the land use types inundated at peak flood levels from May 6 through May 22, 2011.

Findings from this geospatial analysis indicated that 59 percent of the inundated lands were wetlands or wet floodplain forests. Only 2 percent of the land area flooded was classified as developed[2], 37 percent of the land area was pasture or cropland, and 2 percent upland forests. Many of the cropland (farmed) areas were floodplain that historically had been wetland. In Missouri alone there are more than 227,500 acres of cropped floodplain lands (Hickey and Salas 1995). Over time, agriculture crops and development have replaced wetlands and forested floodplains that were originally capable of storing massive amounts of floodwater and decreasing flood peaks (Allen 1993; Faber 1993). Researchers have found that the states that sustained the most damage during the 1993 Mississippi River basin flood had eliminated almost 90 percent of their wetland area (Allen 1993). These alterations to hydrologic processes have lead to more severe and frequent flooding.

The environmental impacts of extreme flooding are complex and have both short- and long-term effects (Hickey and Salas 1995). In southwestern Louisiana, the opening of the Morganza spillway was expected to flood more than three million acres in the Atchafalaya Basin - a large wetland complex with considerable expanses of bayous and bottomland hardwoods. These wetlands and forested floodplains play an important role during flood events by intercepting sediment and nutrient rich runoff, improving water quality, slowing flows, and lowering flood peaks by retaining water.

Some of the potential negative environmental impacts from this flood event include: displacement of wildlife, spread of non-native aquatic species, short-term impacts on water quality including increased levels of nitrate and herbicides, and changes in salinity of estuarine receiving waters along the coast of the Gulf of Mexico.

1. Moderate Resolution Imaging Spectroradiometer
2. NLCD land use categories are limited to features 30 meters and greater

Methods and Limitations: This is a graphic representation of the flooding that occurred between April and May, 2011 along the Mississippi and Ohio Rivers. MODIS imagery was used in this analysis because of its daily imaging of the large geographic area covered by this flooding event. MODIS images were selected nearest to flood crest dates as determined by the National Weather Service's Advanced Hydrologic Prediction Service and compared to a recent pre-flood condition image. Preference was given to images that had the least amount of cloud cover. Areas inundated with water were identified by converting multi-band MODIS imagery to a single band gray scale image and selecting pixels with gray scale values from 0 to a maximum value ranging from 63 to 95. The maximum values were determined by visual inspection of the imagery and varied slightly due to differences in reflectance between MODIS images. Accuracy of the extent of water was limited by the 250 meter resolution of the MODIS imagery and confounded by the extent and type of vegetation, and cloud cover. Areas that were determined to be out of the flood extent based on geographical location and topography were excluded. The flood extent included woody wetland areas identified by the NLCD (2006) that intersected the original flood extent determination. Analysis was conducted in Albers Equal Area Projection, map is displayed in GCS WGS 1984. It is not the purpose of this analysis to be used for any site specific study, assessment of damage or further quantitative measure.

For further information contact: Wetlands_Team@fws.gov

References:

Allen, W.H. (1993). The great flood of 1993: Animals and plants of the floodplain thrive, while river researchers have a field day. BioScience, 43(11): 732-737.

Hickey, J.T. and J.E. Salas. 1995. Environmental effects of extreme floods. U.S.-Italy Research Workshop on the Hydrometeorology, Impacts, and Management of Extreme Floods. Perugia, Italy. 23 p.

National Land Cover Database. 2006. On-line resource: http://www.mrlc.gov/nlcd.php

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