

# Informing Responders Using GIS and GPS

In Defense of Civilization: Cultural Heritage at Risk

Cultural Resource GIS Facility

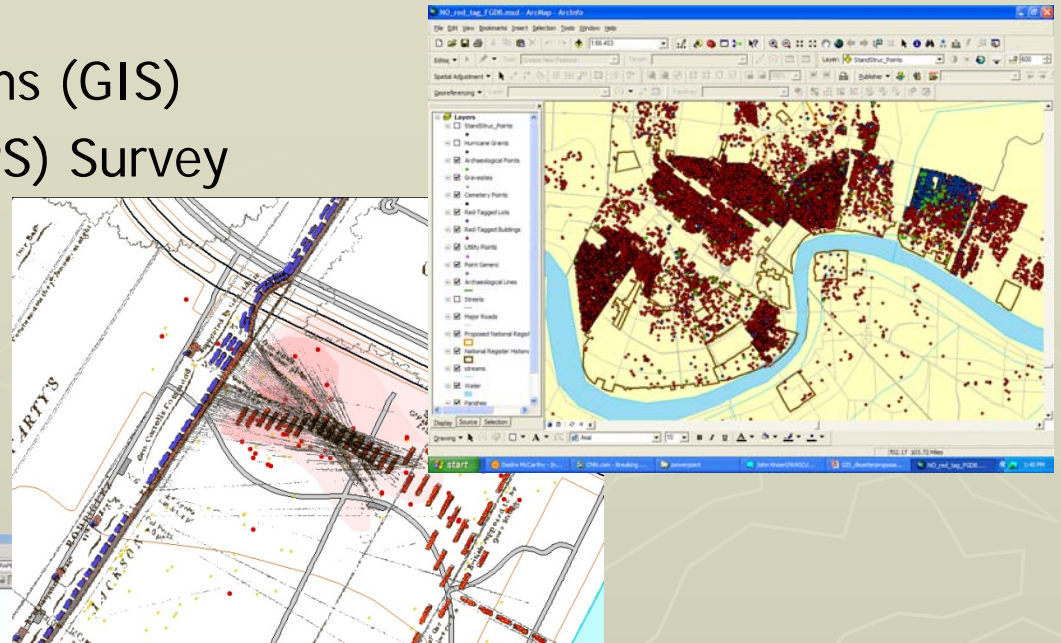
National Park Service

27 October 2017



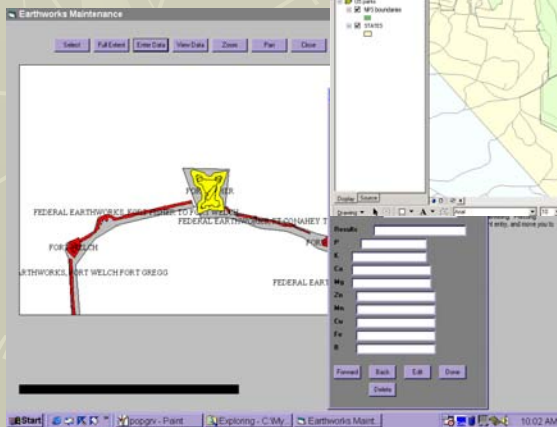
# The Cultural Resource GIS Facility National Park Service

- ▶ Geographic Information Systems (GIS)
- ▶ Global Positioning Systems (GPS) Survey
- ▶ GIS Analysis
- ▶ Cartography and Output
- ▶ GIS Programming
- ▶ GIS and GPS Training



Our primary mission is to assist State/Tribal Historic Preservation Offices, National Park Units, and others in automating data, collecting data, and exploring the use of technology with cultural resource management.

By its nature, GIS integrates data sources, allowing for better visualization, scenario building, data sharing and communication, necessary for landscape management



# Regulatory Need for Cultural Resource Spatial Data

- ▶ The Federal government relies on cultural resource geospatial information to comply with preservation laws, regulations and guidelines

- National Historic Preservation Act
- National Environmental Policy Act
- Archaeological Resources Protection Act
- Abandoned Shipwreck Act
- Native American Graves Repatriation Act
- Historic Sites Act of 1935



- ▶ Section 106, National Historic Preservation Act: Federal agencies are required to identify historic resources and evaluate their significance within areas of Federal undertakings; determine any adverse effects and develop treatment measures to mitigate against those effects



# Federal, State and Local Need for Cultural Resource Spatial Data

The image shows a screenshot of the Texas Historical Commission's website. The top navigation bar includes 'Texas Historical Commission' and various search filters like 'Atlas Home', 'Comment', 'Keyword', 'County', 'Map Address', 'Address', 'Designation', and 'Site Name'. The main content area displays a map of San Augustine County with a search results list on the left and a 'National Register of Historic Places Registration Form' on the right. The map shows various cultural resources marked with colored dots. The registration form includes fields for 'Name of Property', 'Location', and 'Agency Certification', with handwritten entries for 'Bichay Lutheran Church' and '10-25-92'.

- ▶ State and Tribal Historic Preservation Offices, Certified Local Governments and Federal agencies maintain comprehensive inventories of cultural resources totaling over 5 million properties, all with geospatial data
- ▶ These inventories provide Federal agencies with critical data for compliance purposes
- ▶ Resources on these inventories form the pool from which properties are nominated to the National Register of Historic Places
- ▶ Often spatial data collected for these inventories resides on paper maps and information describing the resources resides on paper survey forms, with little consistency among the state/Tribal/Federal inventories

- ▶ The National Register, maintained by the NPS, contains over 90,000 entries including 15,000 districts containing over 1 million contributing resources
- ▶ All of this information is used by Federal, State and local agencies in comprehensive planning efforts, responses to disasters, compliance with various laws, among many other standard procedures

# Scope of the Hurricane Katrina Disaster

- ▶ Hurricane Katrina was the single largest disaster for cultural resources that the US has witnessed since the creation of the National Historic Preservation Act in 1966, totally \$108 billion (in 2005) in property damage, spanning 90,000 square miles in 3 states
- ▶ For the Federal Emergency Management Agency (FEMA), the Katrina event was the largest Section 106 project ever



**Note: Estimates have not yet been made regarding the cultural resource costs related to Harvey, Irma and Maria**



# Section 106 Compliance Related to Katrina

- ▶ In order to be compliant with Section 106, FEMA had to survey and evaluate all of the potential demolitions for their historic significance, consult with the State Historic Preservation Office to develop concurrence, and determine what would mitigate any adverse affects to historic resources
- ▶ To do this, FEMA needed accurate locational information for potential undertakings to understand the extent of the problem
- ▶ FEMA needed an accurate evaluation of the historic significance and nature of the resources, including current photographs

Scope of the problem in New Orleans:

5000 red-tagged structures (eminent threat)

86,000 yellow-tagged structures (major damage)

40,000 green-tagged structures (habitable)



# Disaster Response: Survey and Evaluation

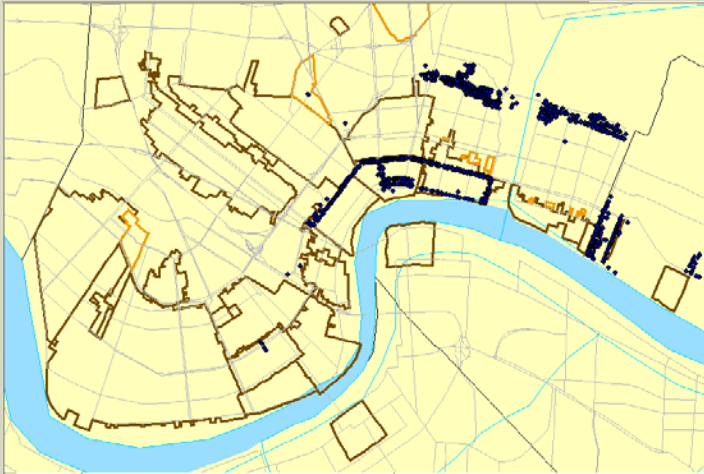
- ▶ FEMA requested the National Park Service, Cultural Resource GIS Facility, develop a strategy for identifying and evaluating all of the affected properties for their National Register eligibility in and around New Orleans
- ▶ The NPS developed a GPS survey strategy for the properties slated for demolition, using hand-held receivers with a detailed data dictionary to document the historic characteristics, condition, integrity and eligibility of each structure.



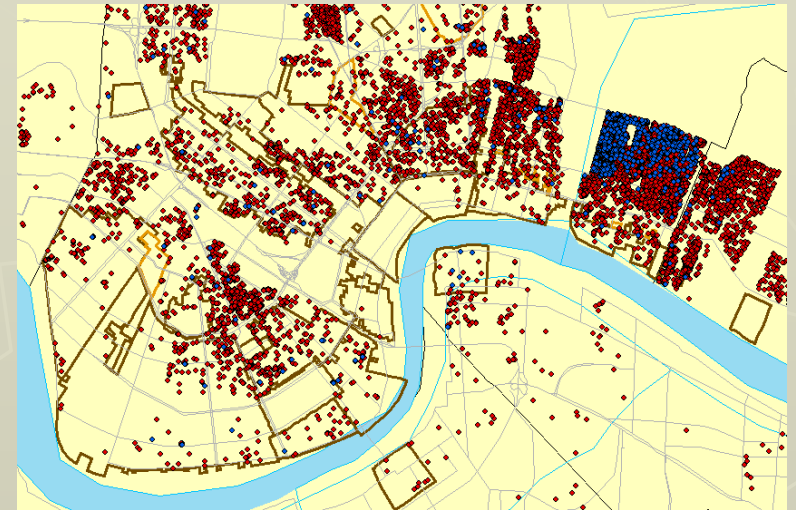
- ▶ This accurate survey produced a form of documentation, as required by Section 106 and a tool to develop concurrence



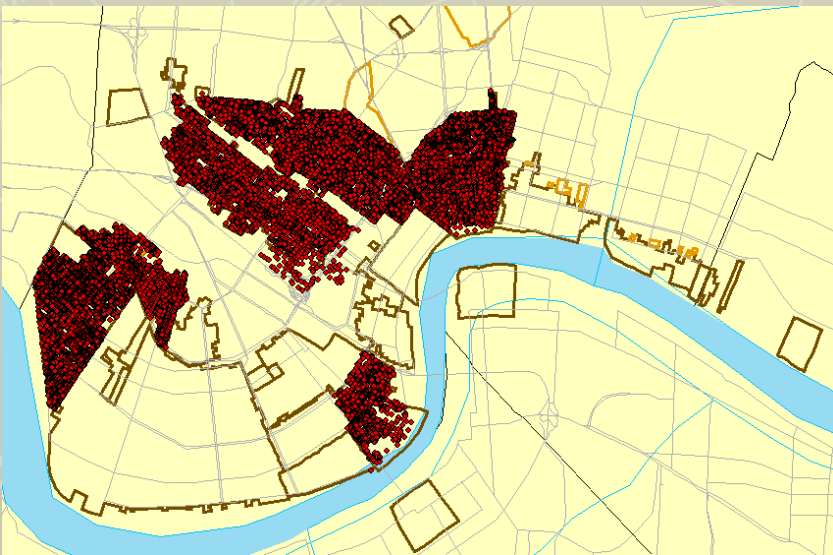
# Cultural Resource Disaster Preparedness in Louisiana



GIS data available in New Orleans: Pre-Katrina  
Approximately 19,000 point locations for resources  
in the state



GIS data collected as part of Katrina Section  
106 survey



GIS data collected as part of Katrina treatment  
measures

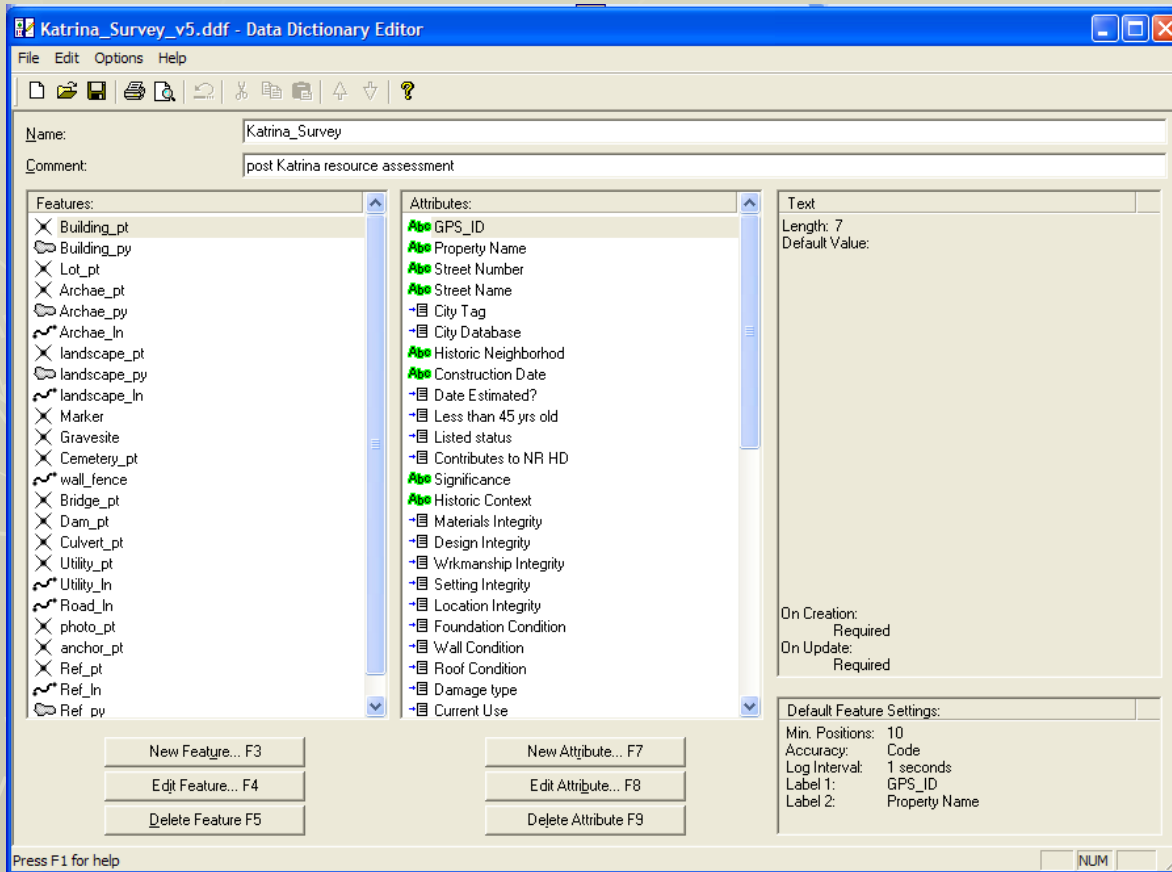
Approximately 60,000 point locations for  
resources in Orleans Parish resulted

Note: In 2017, the FEMA field office in New Orleans  
is still working on Katrina related demolitions



# Facilitating Survey Efforts

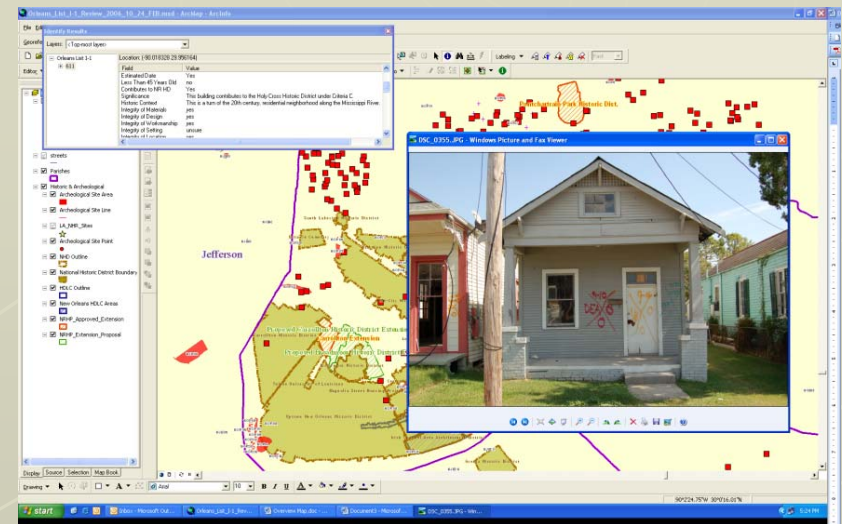
- ▶ To help expedite and simplify the survey process, a data dictionary was created for use in the hand held GPS receivers carried by all surveyors
- ▶ Based on the State Historic Preservation Office standard paper survey forms, the same attributes and attribute values were used to insure compatibility with their existing databases
- ▶ Discussions with FEMA personnel and local historic preservation organizations added more attributes to fully document each resource



- ✦ Using a data dictionary provides structure to the survey, focusing surveyors efforts on target resources and specific attributes of those resources
- ✦ Having a structured and digital survey method helps to eliminate data entry errors and provides a digital survey product from the start

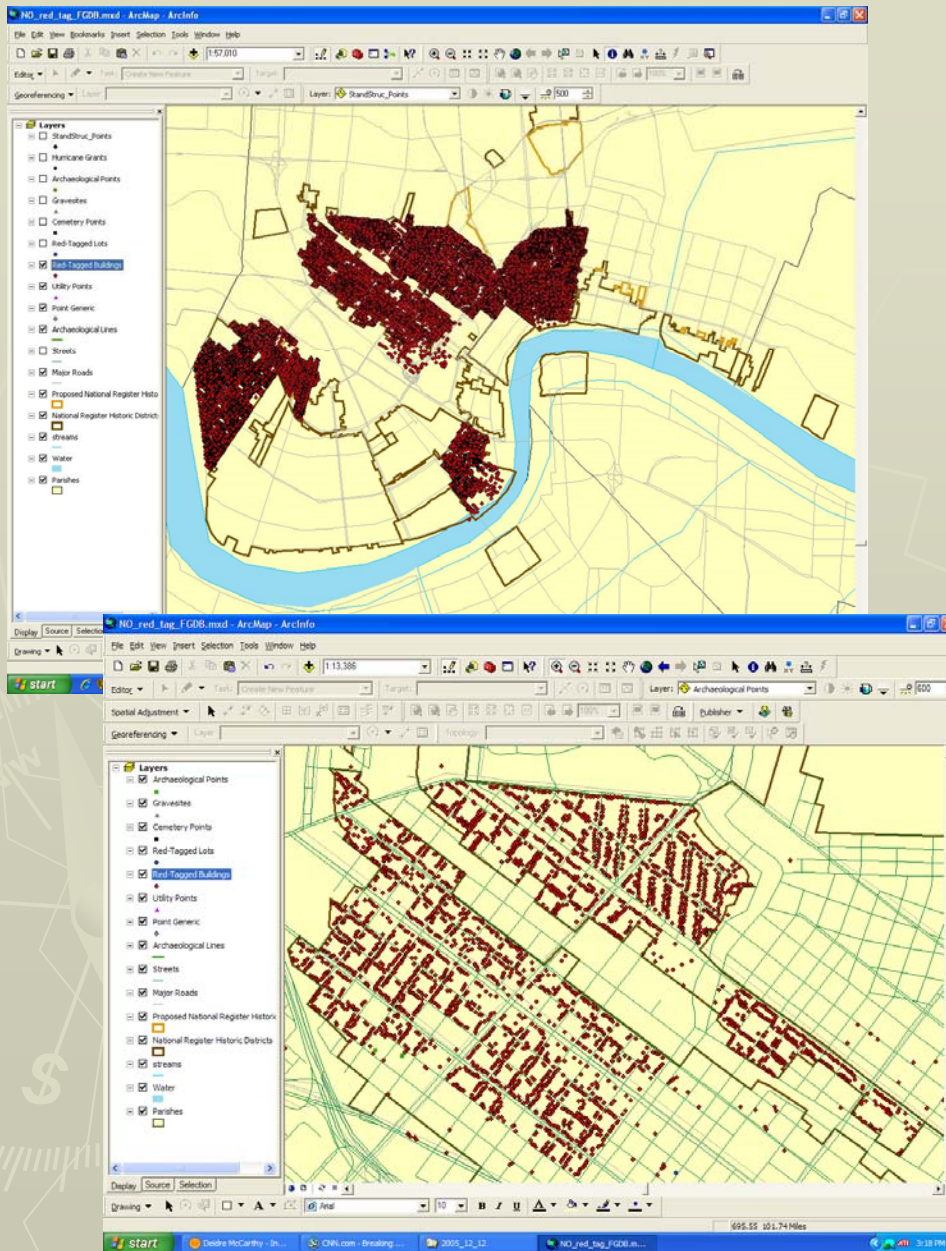
# Workflow of the Survey and Evaluation Process

- ▶ FEMA received lists of target features (demolitions) and sent surveyors to the field to collect GPS data, and descriptive information
- ▶ GPS data, attribute information and digital photos were downloaded from receivers daily for use in analysis, planning future survey efforts, and reporting back to city/county/Federal agencies, providing status updates
- ▶ FEMA and State Historic Preservation Office staff reviewed attributes, photos and other documentation through the GIS to determine if resources were eligible for the National Register
- ▶ Concurrence on eligibility was formed between FEMA and the State Historic Preservation Office quickly and digitally



- For treatment measures, FEMA selected target areas to survey in detail, capturing all contributing and non-contributing resources to historic districts, as well as identifying new historic districts
- Surveyors collected GPS data and the same attribute information for these resources, which were also incorporated into the GeoDatabase for use in analysis and future disaster mitigation

# GPS/GIS in the Disaster Mitigation Phase



- ▶ Historic Districts in New Orleans represent some of the earliest resources determined eligible for the National Register
- ▶ These historic districts contain historic and non-historic elements which change over time
- ▶ Before Katrina no agency recorded the locations of these important elements which would be more vulnerable in a disaster
- ▶ Used the same GPS strategy to document all of the historic and non-historic elements in historic districts as a form of mitigation becomes a preparedness tool

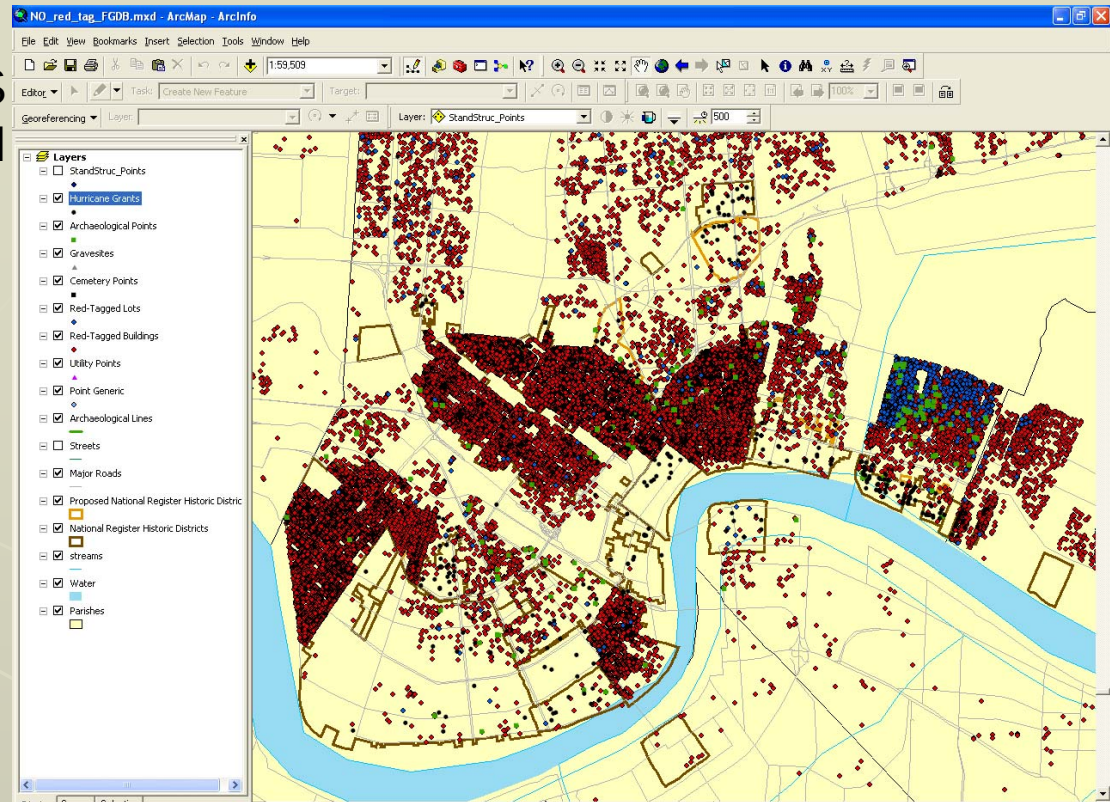
# Assessing the Strategy

- ▶ The GPS documentation of cultural resources, GIS data produced, and the method of reviewing each site for Section 106 purposes is digital for the first time, and now serves as a mitigation or treatment measure for the first time
- ▶ For regulatory purposes the use of GIS to in the Katrina response reduced the amount of time required to assess any one cultural resource from the typical 90 days to 14 days, significantly speeding the recovery process



# GIS in Long Term Cultural Resource Management

- ▶ The cultural resource GPS data integrated through the GIS became a planning tool for local planners to focus recovery efforts toward reconstruction, restoration and rebuilding
- ▶ Government grants and tax incentives, could be targeted to the resources based on the data collected as part of the response and mitigation effort

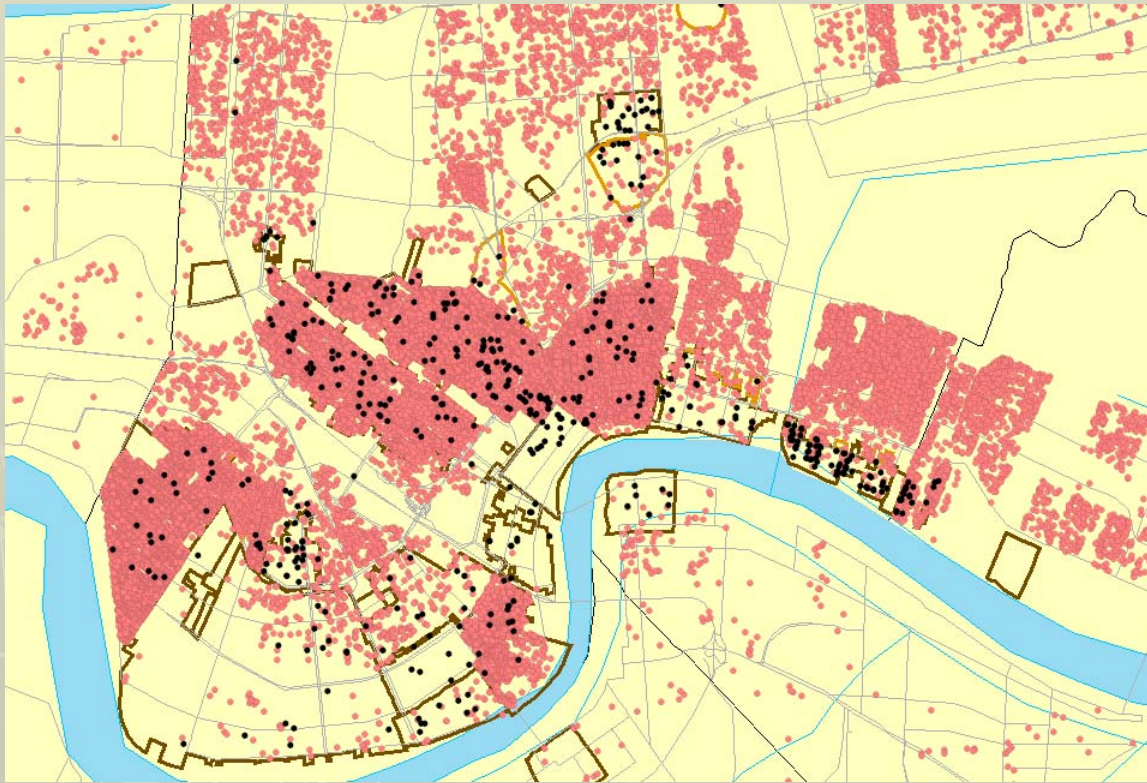


Attributes of Hurricane Grants								
GRANT_ID	GPS_ID	ADDRESS	ZIP_CODE	BUILDING/HA	FIRST_NAME	MIDDLE_NAME	LAST_NAME	
LA-0016		212 Main Street	70542-	Bank of Gueydan				
LA-0075		606 Esplanade Avenue	70116-	Barnett-Bringer House	Glade		Bilby	
LA-0024		3785 La Hwy 18	70090-	Bay Tree Plantation Creole Cot				
LA-0157		4437 Painters Street	70122-	Bayhi House	Jacqueline		DeMagnus	
LA-0391		19068 Moore Road	70438-	Bouey-Moore House	Nevels	Winford	Pittman	
LA-0369	eb04061	2101 Orleans Avenue	70116-	Carver Theater	Eugene		Oppman	
LA-0400	eb05038	2275 Bayou Road	70119-	Chauffe-Reeves House	Cynthia	L.	Reeves	
LA-0469		915 Royal Street	70116-	Cornstalk Hotel	David	B.	Spencer	

Record: 0 Show: All Selected Records (0 out of 545 Selected) Options

## Expanding the Use of Data

- ▶ Attribute data collected during the initial inventory as well as mitigation efforts provided National Register eligibility status and grant eligibility status
- ▶ Using the GIS to manage these grants and to visualize the distribution of recipients provides a new understanding of the programs impact in the community



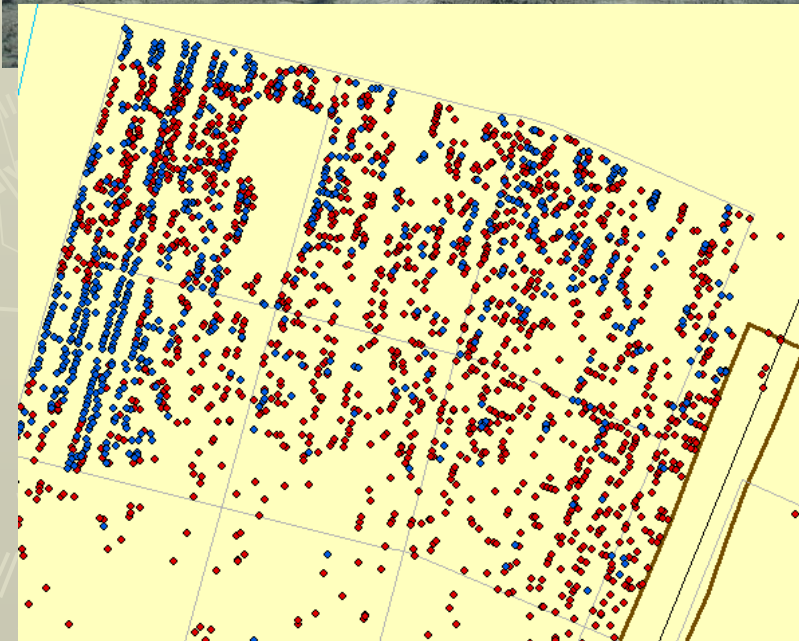
GIS showing all properties surveyed as part of the initial red tag and mitigation inventory efforts. Properties receiving grants shown as black points.



# Survey Challenges

- ▶ Implementing a completely new form of survey and evaluation of cultural resources to comply with Federal regulations during a disaster is a difficult task
- ▶ The need to complete the process with speed is critical, however the need to accomplish the task efficiently within Federal, state and local bureaucracy becomes significantly more difficult
- ▶ Without equipment, trained staff and consistent management, this task becomes extremely challenging





# Survey Challenges

- ▶ Survey work itself in a disaster environment poses significant challenges

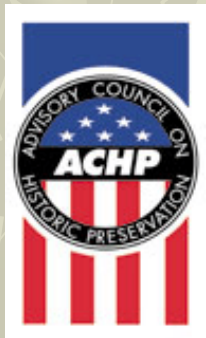


# Lessons Learned From Katrina

- ▶ Disaster preparedness should be a priority
  - Having an accurate, up to date and complete digital inventory of cultural resources including integrity and significance information is critical
  - There is a need to establish appropriate infrastructure and work flow standard operating procedures that can be implemented in a disaster
- ▶ In a disaster response, sharing data and communicating is critical
  - There is a need to have data available quickly and in a format that is easily shared with all potential users which is only possible with data transfer standards in place prior to the disaster
  - There is a need to establish data sharing agreements to insure security, quality and longevity of data
  - There is a need to have personnel familiar with both the technology and cultural resource needs throughout the disaster response
- ▶ Documentation of resources, either traditionally or digitally, is the only way to guarantee the preservation of resources in the face of a disaster

# Recognizing the Critical Need for Digital Cultural Resource Data

- ▶ In 2007 the Advisory Council on Historic Preservation recognized the GPS/GIS approach FEMA implemented in response to Katrina as being very successful and important to the recovery efforts in the Gulf Coast
- ▶ The Chairman's Award for Federal Achievement in Historic Preservation was presented to FEMA at the 2007 annual meeting of the Advisory Council
- ▶ The 2008 Preserve America initiative, partnering with the Advisory Council presented recommendations to the White House on historic preservation listing the creation of a comprehensive digital inventory of historic properties as a top priority
- ▶ FEMA proposed to the White House that creating a comprehensive digital inventory of historic properties would be critical to enhancing disaster preparedness planning process for cultural and natural resources



# 2017: Harvey, Irma, Maria



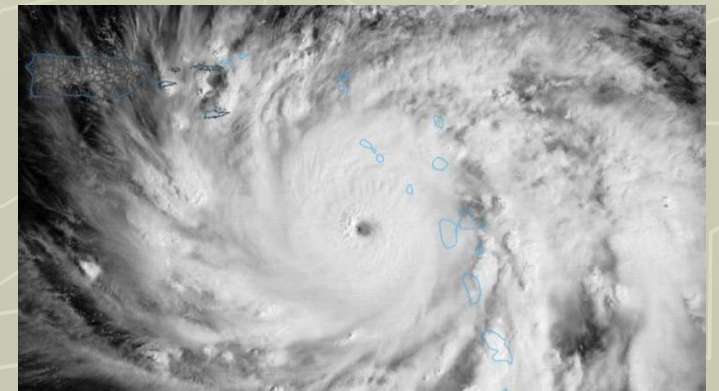
Katrina vs Irma



Irma



Harvey



Maria

# Lessons From Katrina: Applied in 2017

- ▶ Similar to the series of hurricanes in 2005 that struck the mainland United States, in 2017 hurricanes Harvey, Irma and Maria have devastated the Caribbean, Florida, and Texas
- ▶ Disaster preparedness has become a higher priority
  - We still do not have complete digital inventories of cultural resources including integrity and significance information, although there the use of GIS is widespread in managing cultural resources
  - We now have the Unified Federal Environmental and Historic Preservation Review process providing underlying agreements and structure, although no set survey strategy for cultural resources
- ▶ In a disaster response, sharing data and communicating will always be critical
  - We now have cultural resource spatial data exchange standards to facilitate data sharing, along with new developments in platforms to share data
  - There is still a need to establish data sharing agreements to insure security, quality and longevity of data
  - There is still a need to have personnel familiar with both the technology and cultural resource needs throughout the disaster response
- ▶ Documentation of resources, either traditionally or digitally, is still the only way to guarantee the preservation of resources in the face of a disaster

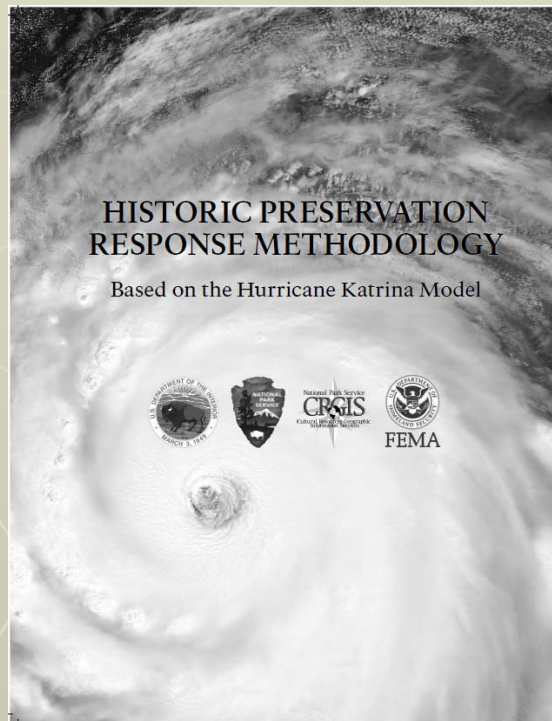
# New GIS Tools Can Assist in Disasters

- ▶ 12 years after Katrina, the state of GIS technology as well as availability of data changes how we apply these tools, enhancing preparedness, response, communication and resource stewardship following a disaster



# GIS/GPS Disaster Response Methodology Tools

- ▶ The NPS has documented the entire GIS/GPS historic preservation disaster response methodology
- ▶ This methodology contains all of the tools, data dictionaries, workflow diagrams and background information to implement a similar strategy for any disaster



Text of the methodology document is available at:

[http://www.nps.gov/crgis/crgis\\_guidelines.htm](http://www.nps.gov/crgis/crgis_guidelines.htm)



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