

Your Name: _____

GIS-Based Lesson: Hurricane Analysis with Public Domain State and National Data

Skills Involved:

- 1) Downloading and formatting data from a variety of public domain data sources for use in a GIS.
- 2) Examining metadata for public domain data.
- 3) Solving a natural hazards problem based on spatial analysis.

NOAA, FEMA, and the State of Texas Office of Emergency Preparedness have formed a joint operations working group to assess hurricane hazards in eastern Texas. They have hired you to examine these hazards from a spatial perspective and prepare a final report that will provide guidance to local, state, and national agency decision-making.

Data Management

Create a folder on your computer or on the network where you will store the data. Make sure this folder has a name that is logical so that you will understand what its contents are, and without spaces to avoid problems in ArcGIS.

Go to the TNRIS web site to download the data:

www.tnrис.org



- 1) What is TNRIS and what is its importance to the geospatial user community?

Scroll down to the "Hurricane Rita Data Resources" and access this site. You should now be at the following site:

<http://www.tnrис.org/HurricaneRita/>



Download:

1. East Texas Cities
2. East Texas Counties
3. Hurricane Risk Zones
4. Landfills

2) What is the projection for these data sets and at what scale were they generated?

Next, you will access NOAA's Coastal Services Center, at:

<http://hurricane.csc.noaa.gov/hurricanes/index.htm>



3) What is NOAA and what is NOAA's importance to the geospatial community?

On left, click on "Download Storm Track Datasets"

Select: Download storm tracks for the Atlantic Basin.

4) Describe this data set, indicating the most important information that you think GIS users would like to know.

Next you will access data from the Texas General Land Office (GLO).

5) What is the GLO and what is its importance to the geospatial data community?

Go to the Texas General Land Office GIS site:



<http://www.glo.state.tx.us/gisdata/gisdata.html>

Download the shape files for:

1. Elevation
2. Hydrography-general 1:2,000,000 scale
3. Roads and Highways
4. Shoreline.

Note that the link for shoreline directs you to NOAA.

It asks you to visit the shoreline data site:

<http://www.csc.noaa.gov/shoreline/>

From there, go to "Data Central" and then "Download Historical Shoreline".
You should be on the page:

<http://www.csc.noaa.gov/shoreline/data.html>

Go to Texas and download the shape file for the historical shoreline.

Lastly, back up to the Texas General Land Office GIS page and download:

5. Oil and Gas Leases

Access the ESRI Canada site for a 2005 Hurricane Rita shape file:

<http://k12.esricanada.com/metadata/hurricanes.html>

This data was compiled from FEMA (Federal Emergency Management Agency) and NOAA sources.

Unzip all your data into logical folders in keeping with good data management practices.

Access ArcMap and add your North Atlantic hurricane data. Save your ArcMap map document.

- 6) What time period does the North Atlantic hurricane data set cover?
- 7) What length of time does each row (line segment) in the North Atlantic hurricane data cover?

Add the layers:

- East Texas Cities
- East Texas Counties

Clip the hurricanes to the extent of the East Texas Counties.

- 8) How many hurricane tracks (individual segments) crossed east Texas?

9) What is the name of the latest hurricane to move across east Texas, according to this data set, and during what year did it do so?

Symbolize the hurricane tracks as lines with an arrow at the end.

10) In what direction(s) do most of the hurricanes move across East Texas?

11) What is the date of the hurricane that had the lowest pressure in the dataset?

Examine the path of this hurricane.

12) What major city (2000 population 57,247) on the barrier island, southeast of Houston, did this hurricane pass through?

13) Conduct some online research about this particular hurricane, using the date and city you indicated above as your search terms, and state why this hurricane was so devastating.

Go to the TNRS site (www.tnris.org) and download the new (2004) aerial photograph that covers the city most impacted by this hurricane.

14) What aerial do you need to download to capture the central part of this city?

15) What is the file format of the aeriels on this site?

16) What geographic extent do each of the aeriels cover?

17) Upon examining the aerial photograph, why would you say this region is so prone to hurricane damage?

18) Export a layout into this lab document that includes the aerial photograph, the North Atlantic hurricane tracks, and the particular hurricane that you are now examining **shown in a different color and symbol**.

19) How many other hurricanes (besides the hurricane you have been examining) passed within 30 kilometers of this city?

20) Indicate the methods you used to find the answer to the previous question.

Add your Hurricane Rita track.

21) Through which part of the east Texas study area did Rita cross?

22) Through which counties did Rita pass?

23) Describe Rita's storm category, wind speed, and atmospheric pressure while it passed through east Texas.

24) How long did it take Rita to pass through east Texas?

These Rita shape points do not tell the whole story, of course. Examine this image of Rita on:

<http://www.lcrediscovery.org/k12gis/edesk/Users/2/Rita/23-05-14-45.jpg>

25) Estimate the width of Hurricane Rita just before it made landfall.

26) What steps would be required if you wanted to examine this image within your ArcMap session? (There is no need to perform these steps. Just indicate what you would have to do to bring it in).

Add your Hurricane Risk layer and map it based on Unique Value on attribute risk_area.

27) Based on its location, which category of risk would you say is the most serious? Why?

28) How many east Texas cities are within the top 2 risk categories?

29) Indicate how you found out the answer to the question above.

30) What is the largest city (in population) within the top 2 risk categories?

Add your elevation data and your landfills data.

31) How many cities in east Texas are below 200 feet in elevation?

32) How many of these cities are also in the top 2 risk categories?

33) Indicate how you found out the answer to the previous question.

34) How many landfills are below 200 feet in elevation?

Examine the Hydro 1:2,000,000 data.

35) What are the top 3 reservoir(s) and surrounding areas that would you say are most at risk from hurricane damage to the dams that hold these reservoirs? Why?

Add the US DOT roads layer and use the attribute SIGN1 to answer the following question.

36) What roads could you use to evacuate people from these 3 reservoirs?

Compare the East Texas Counties layer with the shoreline polygon layer.

- 37) Which layer would you use for any sort of proximity analysis to determine which cities are within 50 miles of the coastline? Why?
- 38) Is there anything that you can determine by using ArcCatalog to analyze the metadata that would indicate the reason for the difference?
- 39) How many cities are within 50 miles of the coastline?
- 40) How many cities are within 50 miles of the coastline **and** in the highest risk zone?

Add the oil and gas leases data.

- 41) What are legitimate criteria and procedures that you would use to assess the risk to these oil and gas leases from a hurricane?
- 42) Summarize in a few sentences what you have learned about spatial data from various sources to make natural hazards assessments in this lesson.
- 43) Summarize in a few sentences what you have learned about GIS in this lesson.

*** End of Lesson: Hurricane Analysis ***