



NOAA Satellites and Information

National Environmental Satellite, Data, and Information Service



Coastal Risk Atlas

Brief to the Stennis Space Center Rotary Club

June 29, 2004

Kelly Boyd
National Coastal Data Development Center



NOAA Satellites and Information

National Environmental Satellite, Data, and Information Service



NCDDC Overview



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Please choose one of the following:

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Username:

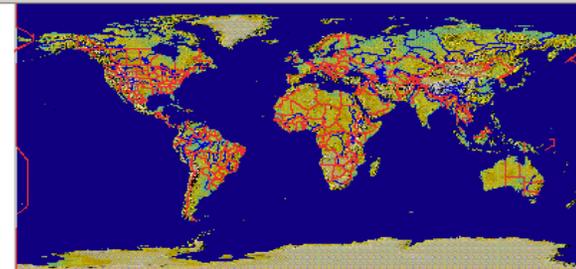
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- States
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- U.S. Territories
- Bodies of Water
- IN CONJUNCTION WITH
- INSTEAD, USE



Enter in any extra Spatial keywords you would like to include in your search.

North West South East

Theme

Theme Keywords:

Enter any extra Theme keywords you would like to include in your search.

Time

Please use the following date format: YYYY, YYYY/MM, or YYYY/MM/DD

Enter start date:

Enter end date:

- IN CONJUNCTION WITH
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Temporal Keyword:

<http://www.ncddc.noaa.gov>





NOAA Satellites and Information

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Search Results

Search Criteria:
 Station ID Search: Go
 Station List: Station SGOF1, Tyndall AFB Tower C (N4), Florida, was established in 1964
 Station 41001 - 150 NM East of Cape Hatteras, NC
 Coordinates: 34.68 N 72.66 W (34°41'00" N 72°39'42" W)
 Available historical data for station 41001 include:
 • Quality controlled data from September
 ◦ Standard Meteorological data and their description
 ◦ Continuous winds data and their description

Search Results:

	Title: Meteorological and Oceanographic Data Collected from National Data Buoys Center (NDBC) Moored Buoy Station 41001 Located 150 NM east of Cape Hatteras for the Time Period of April 1978 to Present
	Title: Meteorological and Oceanographic Data Collected from National Data Buoys Center (NDBC) Moored Buoy Station 41001 Located 150 NM east of Cape Hatteras for the Time Period of April 1978 to Present
	Title: Meteorological and Oceanographic Data Collected from National Data Buoys Center (NDBC) Moored Buoy Station 41001 Located 41 NM east of Cape Hatteras for the Time Period of April 1978 to Present

Item Details (Item 2196):
 Meteorological and Oceanographic Data Collected from National Data Buoys Center (NDBC) Moored Buoy Station 41001 Located 150 NM east of Cape Hatteras for the Time Period of April 1978 to Present
 Metadata also available as:
 • Identification Information
 • Distribution Information
 • Metadata Reference Information
 Citation:
 Originator: NOAA/NWS/NDBC (National Data Buoys Center)
 Publication Date: Unpublished material
 Title: Meteorological and Oceanographic Data Collected from National Data Buoys Center (NDBC) Moored Buoy Station 41001 Located 150 NM east of Cape Hatteras for the Time Period of April 1978 to Present



- Online metadata generation tool, MERMAid (Metadata Enterprise Resource Management Aid)
- Web-based secure tool featuring instant validation to FGDC standard

Address <https://mermaid.ncddc.noaa.gov/mermaid/ncddc/kelly/manage>

File Edit View Favorites Tools Help

Links LA MS FL Weather ArcObjects ArcScripts Search Dictionary

kelly

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 - ptcontac
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 - spdoinfo
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 - spref
 - +
 - eainfo
 - +
 - distinfo
 - +
 - M metainfo
 - +
 - ncdc

Legend:
Mandatory: or - Mandatory
Mandatory-if-applicable: or - Mandatory-if-applicable
Optional: or - Optional
V - Validation Instructions

NOTICE: **Saving and Recovering Information**

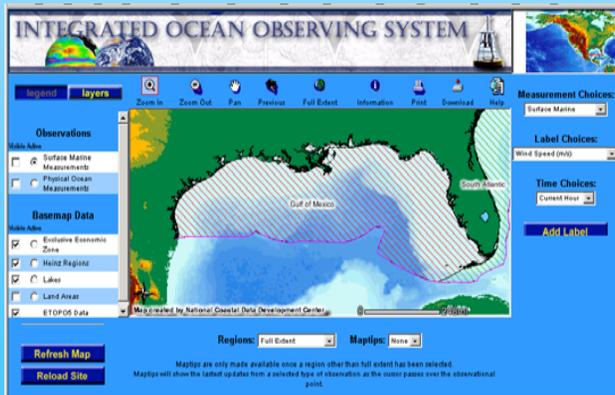
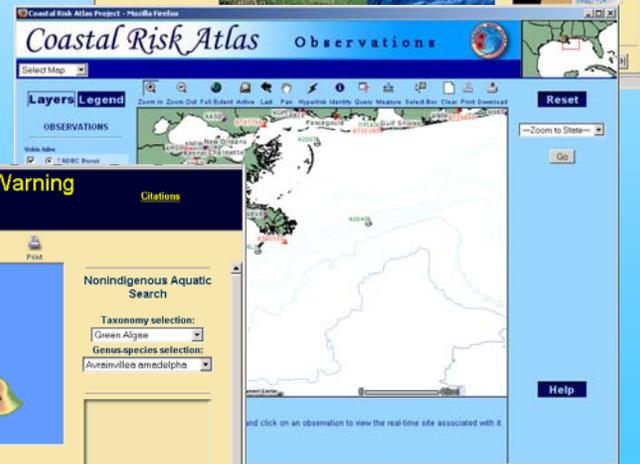
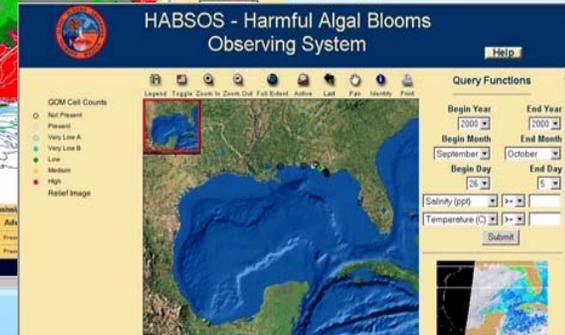
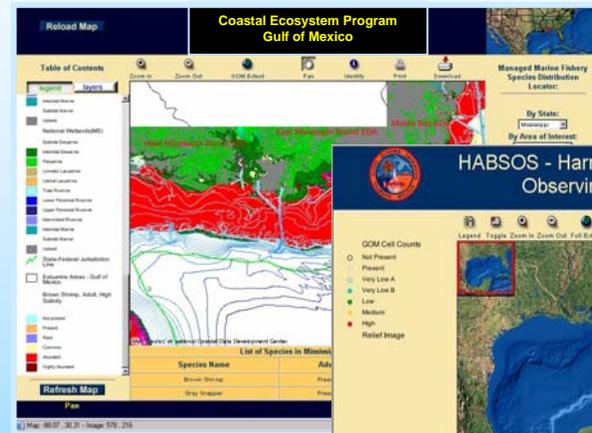
Name	Value
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Originator



Web Mapping Services

- Project-based
- Time Series Model
- Custom Queries
- Fixed Zoom to Area
- Custom look and feel



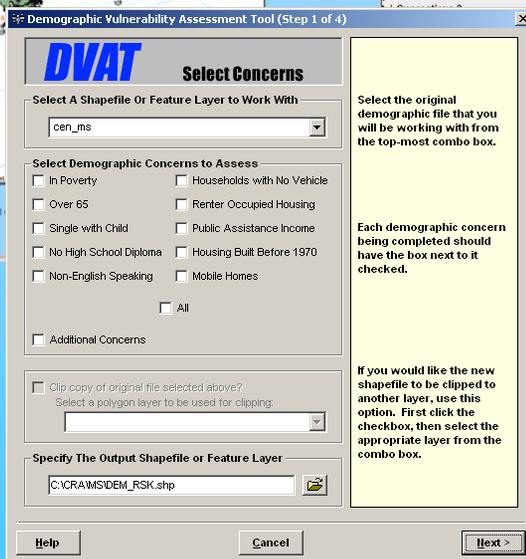


Coastal Risk Atlas

Based on the methodology of NOAA Coastal Services Center's Community Vulnerability Assessment Tool (CVAT).

The CRA provides the data necessary to conduct vulnerability assessment using the CVAT methodology.

The project can help to improve storm mitigation efforts by providing easier access to distributed data.





- The process of hazard identification and analysis.
- The determination of resultant threat to:
 - Critical Infrastructure
 - Societal Factors
 - Economic Resources
 - Natural Environment

Vulnerability Assessment





Hazard Identification

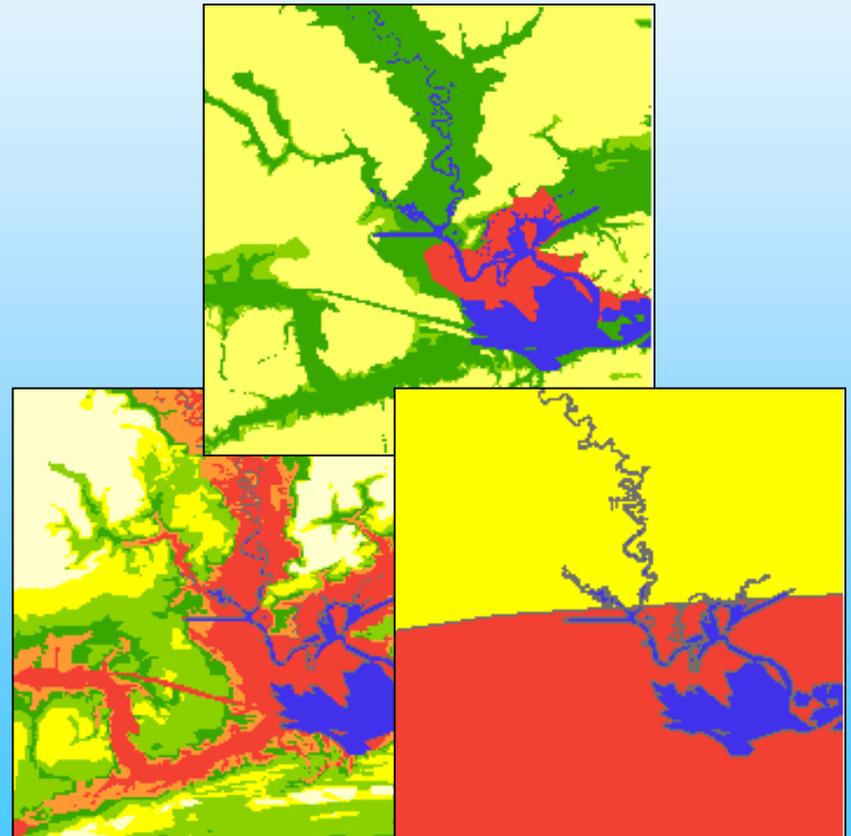
Storm Surge Inundation

Damaging Wind

Inland Flooding

Hazardous Spills

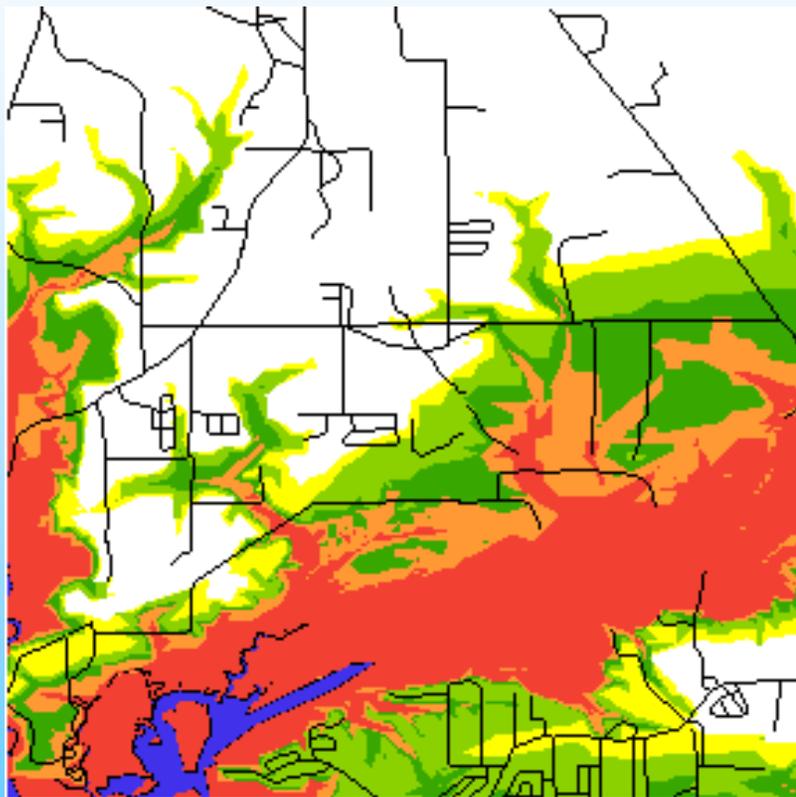
Toxic Release





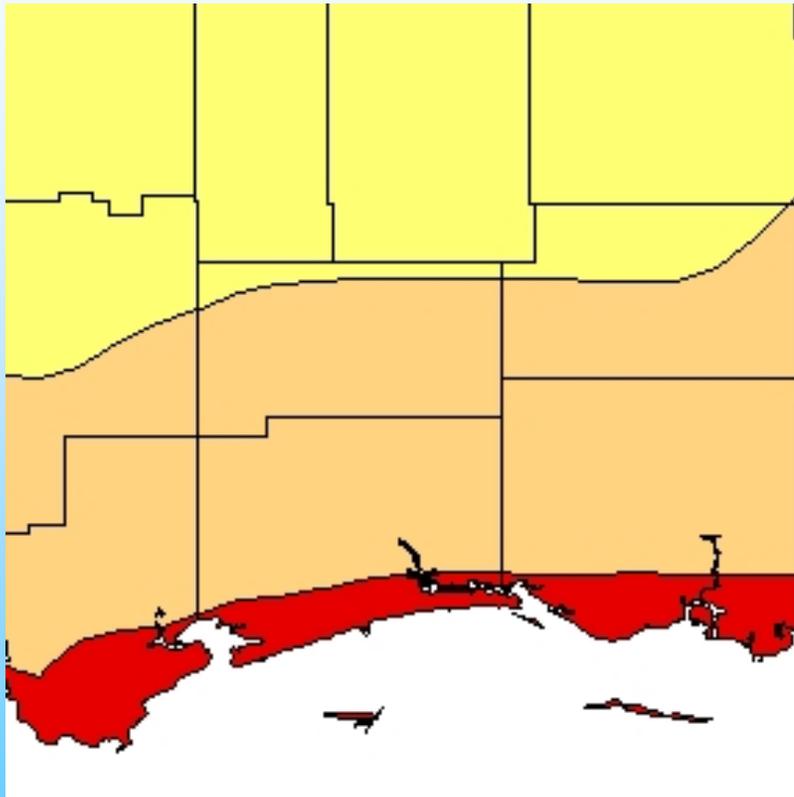
Storm Surge

- The abnormal rise in water bodies caused by wind forcing.
- Maps depict areas of potential surge inundation for each of the five Saffir-Simpson hurricane intensities.



Data Source: Army Corps of Engineers Mobile District

Saffir-Simpson Category	VI
Category 1	5
Category 2	4
Category 3	3
Category 4	2
Category 5	1



Data Source: FEMA Hazards
US/National Hurricane Center

Wind Envelopes

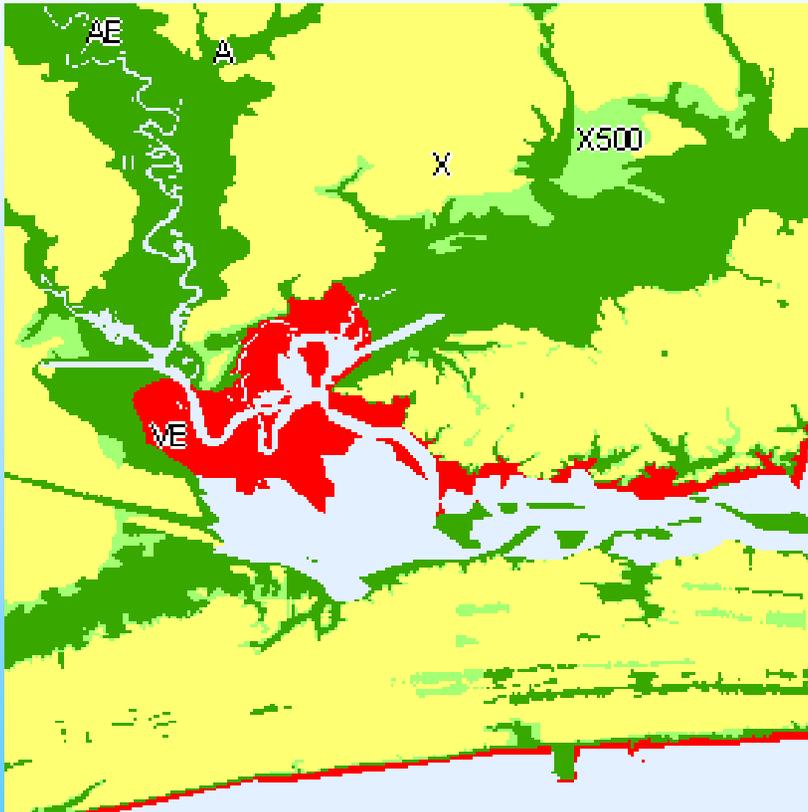
- The Demaria and Kaplan model is used by the National Hurricane Center to estimate the maximum sustained winds for inland moving hurricanes.
- Maps depict the average wind speeds when a hurricane makes landfall.

Wind Speed	VI
127 mph winds	3
109 mph winds	2
92 mph winds	1



FEMA Q3 Flood Data

- FEMA Q3 data depicts likely areas subject to inland flooding based on vectorized versions of FEMA Flood Insurance Rate Maps.



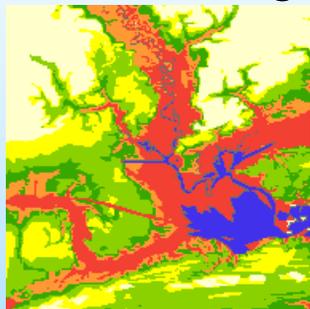
Data Source: Federal Emergency Management Agency

Zone	VI
Velocity Zone	5
100-year	4
500-year	3
Outside Flood Zone	2



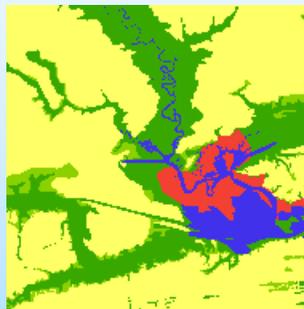
Using GIS to Create the Analysis Layer

Storm Surge



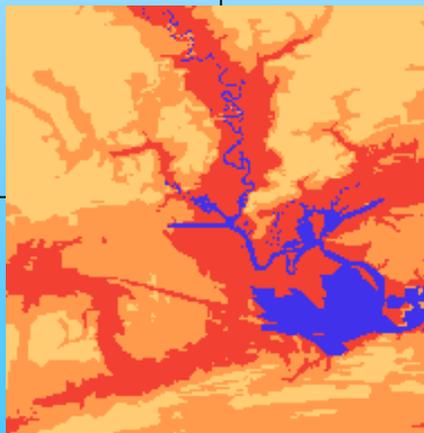
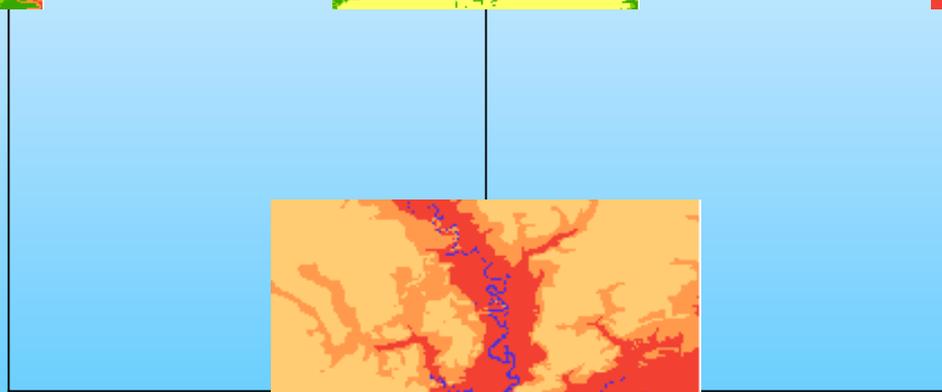
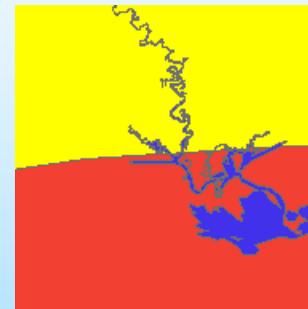
+

FEMA Q3



+

Wind Envelopes



Combined Vulnerability



Hazard Vulnerability Index Calculation

ArcView tabular edits are made using VBA scripts within Field Calculator.

The screenshot shows the 'Attributes of ms_tot_rsk1' table with columns: WIND_SPD, WND_RS, BufferDist, TRI_RSK, TOT_RSK, haz_rsk, and a location column. A 'Field Calculator' dialog box is open, showing the 'Number' type selected and a list of functions. The 'TOT_RSK' field is being calculated.

WIND_SPD	WND_RS	BufferDist	TRI_RSK	TOT_RSK	haz_rsk		
0	0		0	1	9	Medium Risk	Jackson
0	0		0	1	9	Medium Risk	Jackson
0	0		0	1	9	Medium Risk	Jackson
0	0		0	1	9	Medium Risk	Jackson
				1	8	Medium Risk	Jackson
				1	8	Medium Risk	Jackson
				1	12	Medium-High Risk	Jackson
				1	9	Medium Risk	Jackson
				1	11	Medium-High Risk	Jackson
				1	8	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	11	Medium-High Risk	Jackson
				1	9	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	8	Medium Risk	Jackson
				1	11	Medium-High Risk	Jackson
				1	12	Medium-High Risk	Jackson
				1	9	Medium Risk	Jackson
				1	12	Medium-High Risk	Jackson
				1	8	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	12	Medium-High Risk	Jackson
				1	8	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	12	Medium-High Risk	Jackson
				1	8	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	9	Medium Risk	Jackson
				1	9	Medium Risk	Jackson



Critical Facilities

Determining where critical facilities are particularly vulnerable can serve mitigation efforts and assist in future development decisions.

Schools

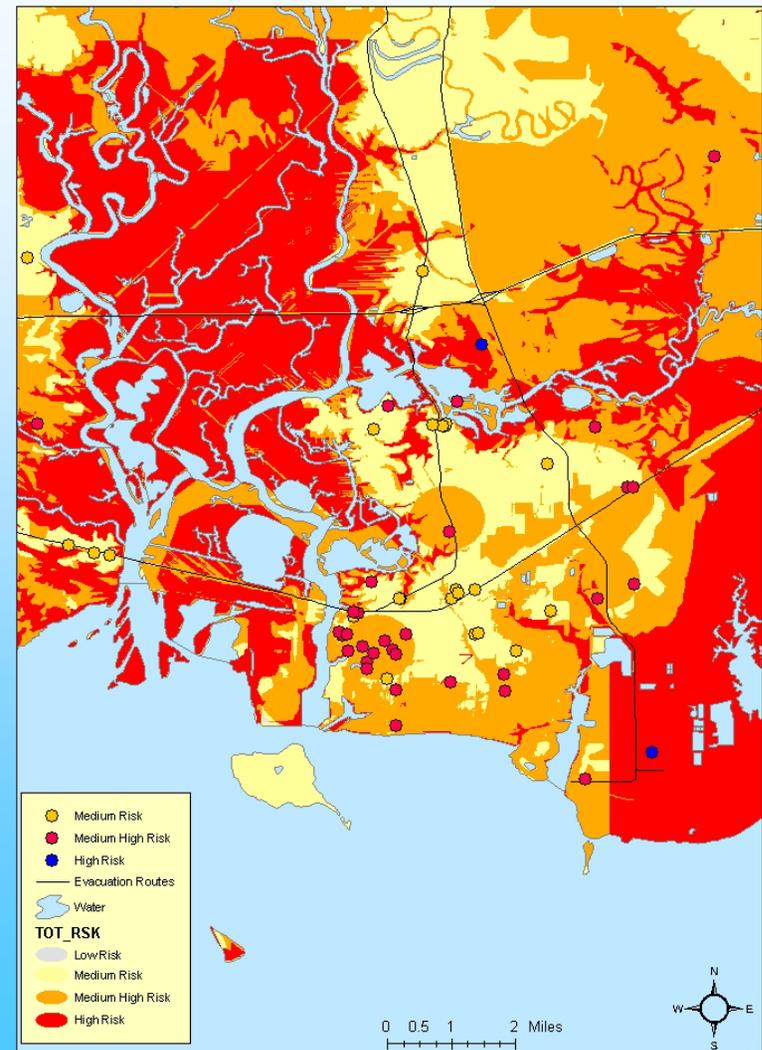
Hospitals

Airports

Police Stations

Fire Stations

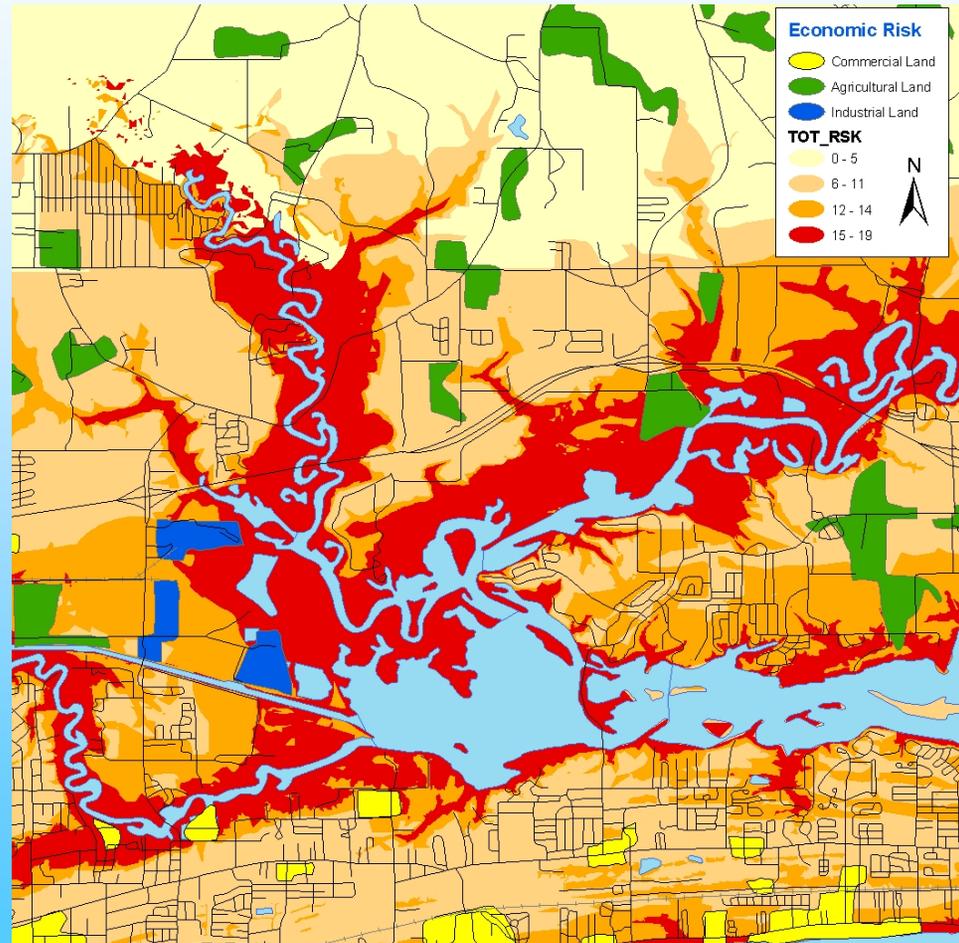
Communication Systems





Economic Resources

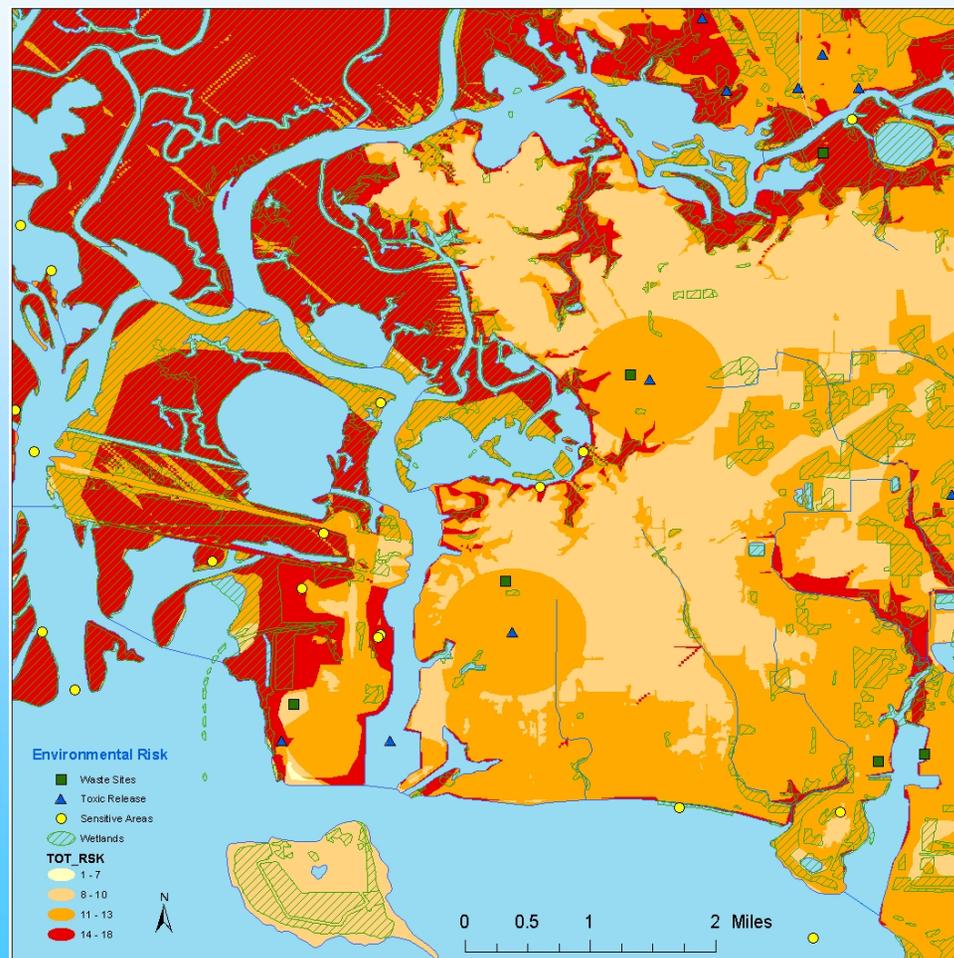
- Economic Analysis involves the identification of key centers of the local economy relative to potential coastal hazards.
- The CRA employs land use data to identify concentrations of specific economic activities.





Natural Environment

- Coastal storms often cause habitat loss and displacement disrupting the natural ecological processes of the specified area.
- A user can gauge potential impacts to the environment by coupling high valued habitats with areas of high vulnerability and possible pollution sources.





Social Vulnerability Assessment

- Census data at the blockgroup level is used to map concentrations of socially vulnerable populations.
- The CRA addresses ten different societal factors.

Poverty

Public Assistance Income

Lack of Transportation

No High School Diploma

Lack of English Proficiency

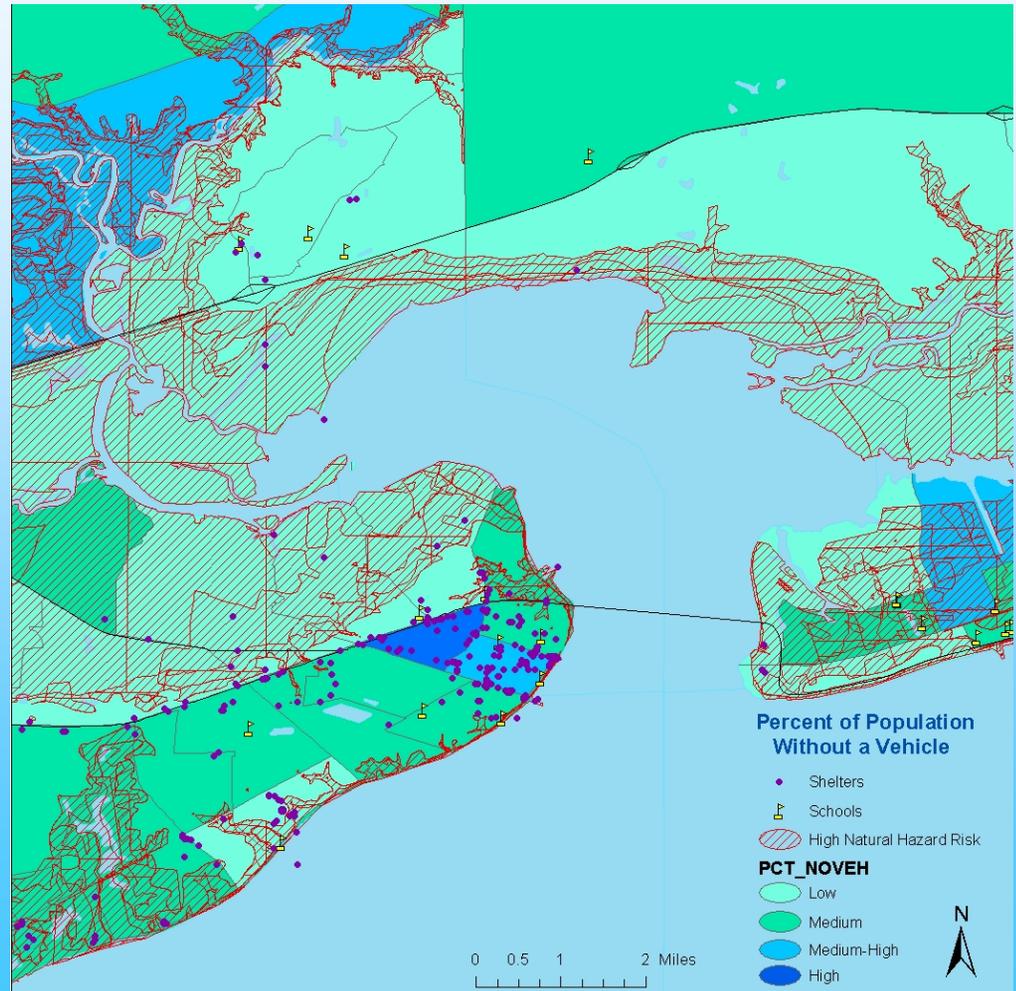
Single Parent Households

Elderly

Housing Units built before 1970

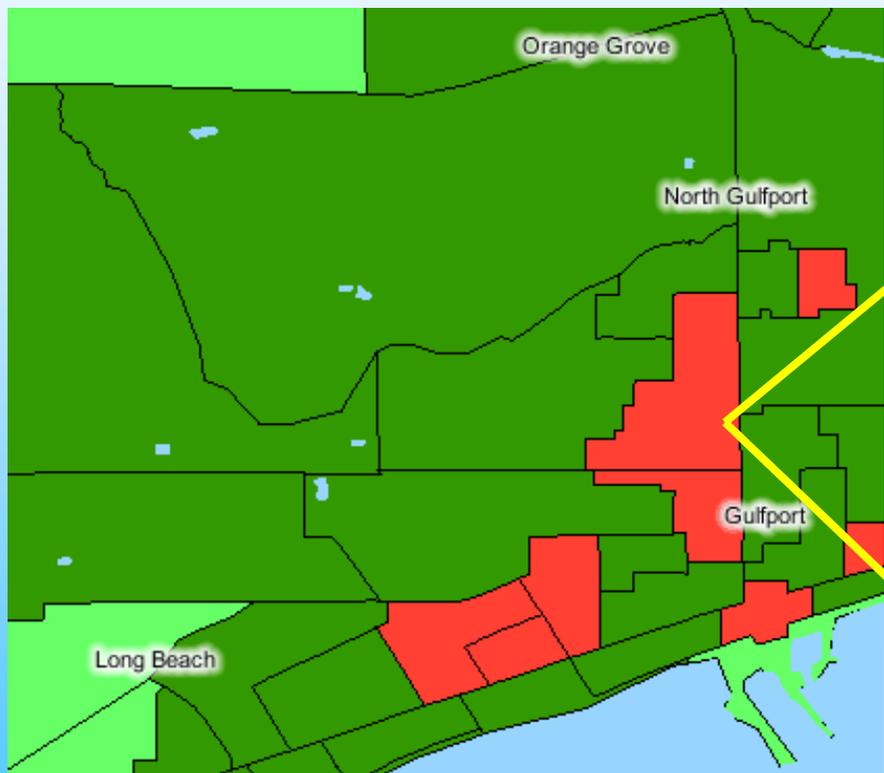
Mobile Homes

Rental Units





Societal Analysis



Data Source: US Census Bureau

Societal Factor	Percentage
Poverty	47%
Rental Units	54%
Pre 1970 Structures	42%
Mobile Homes	13%
Public Assistance	4%
Over 65	10%
No Vehicle	19%
No Diploma	51%
No English	0%
Single w/ Child	34%



ArcGIS Extension Tools

- Demographic Tool
 - Automates the process of calculating Census percentages.
 - Dynamic assessment tool being developed.
- Hazard Analysis Tool
 - Automates the process of creating the composite hazard layer.

Demographic Vulnerability Assessment Tool (Step 1 of 4)

DVAT Select Concerns

Select A Shapefile Or Feature Layer to Work With

grp_fl

Select Demographic Concerns to Assess

In Poverty Households with No Vehicle

Over 65 Renter Occupied Housing

Single with Child Public Assistance Income

No High School Diploma Housing Built Before 1970

Non-English Speaking Mobile Homes

All

Additional Concerns

Clip copy of original file selected above?
Select a polygon layer to be used for clipping:

Specify The Output Shapefile or Feature Layer

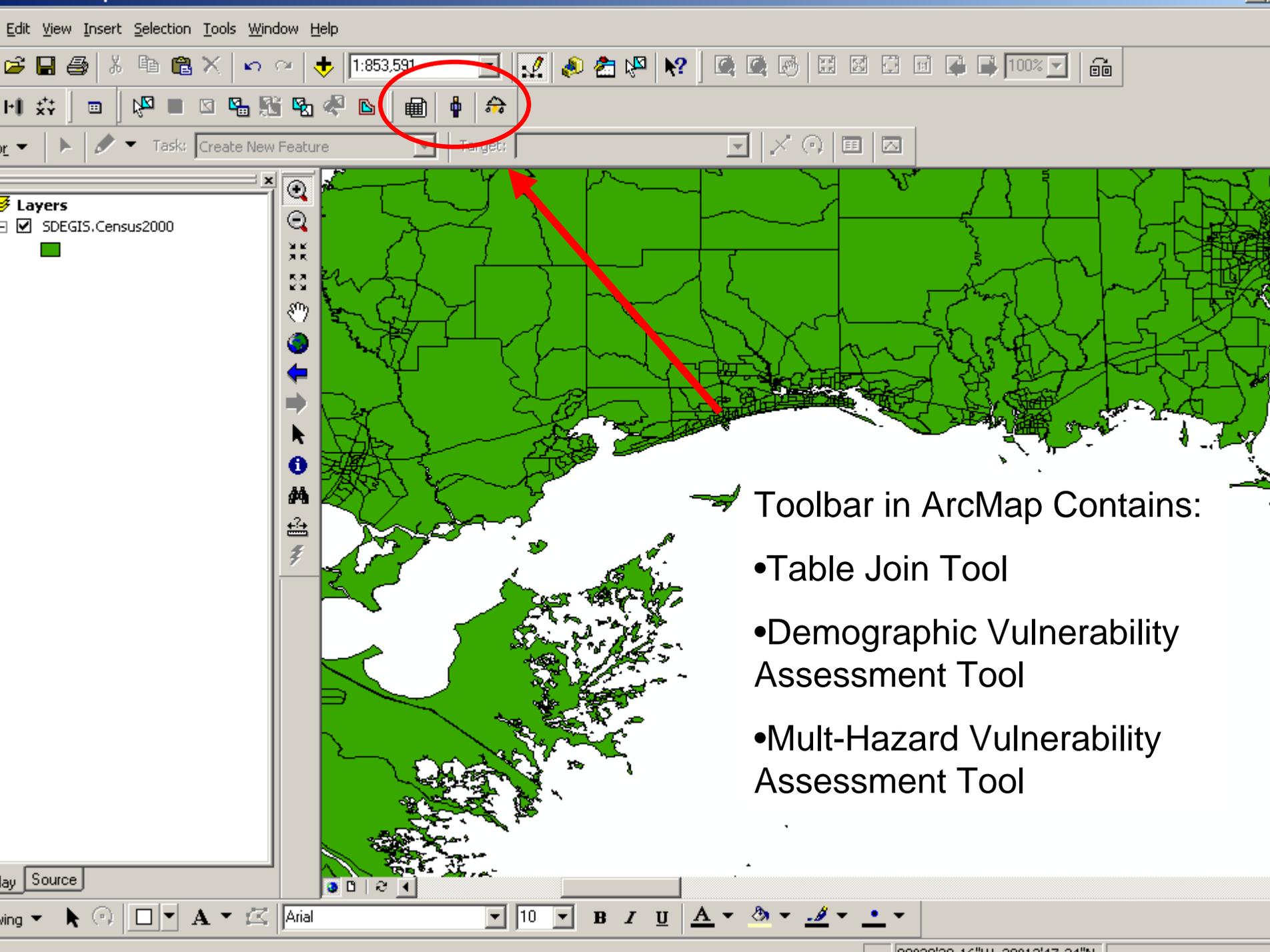
C:\CRA\basemap\DEM_RSK.shp

Select the original demographic file that you will be working with from the top-most combo box.

Each demographic concern being completed should have the box next to it checked.

If you would like the new shapefile to be clipped to another layer, use this option. First click the checkbox, then select the appropriate layer from the combo box.

Help Cancel Next >



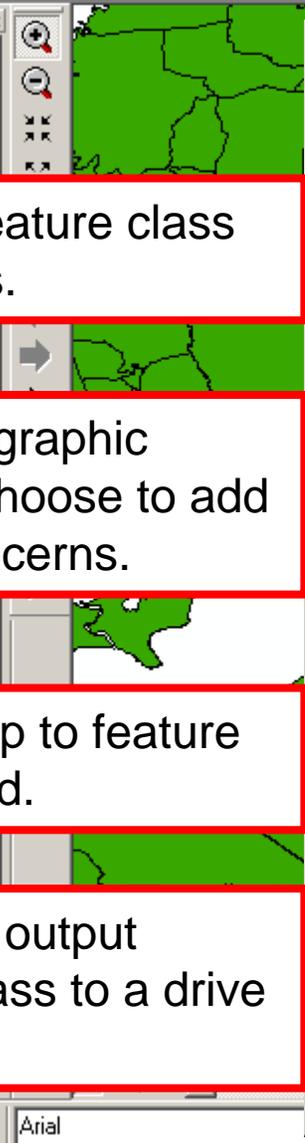
Toolbar in ArcMap Contains:

- Table Join Tool
- Demographic Vulnerability Assessment Tool
- Multi-Hazard Vulnerability Assessment Tool



Task: Create New Feature Target:

Layers
SDEGIS.Census2000



Demographic Vulnerability Assessment Tool (Step 1 of 4)

DVAT Select Concerns

Select A Shapefile Or Feature Layer to Work With
SDEGIS.Census2000

Select Demographic Concerns to Assess

<input checked="" type="checkbox"/> In Poverty	<input type="checkbox"/> Households with No Vehicle
<input type="checkbox"/> Over 65	<input type="checkbox"/> Renter Occupied Housing
<input type="checkbox"/> Single with Child	<input type="checkbox"/> Public Assistance Income
<input type="checkbox"/> No High School Diploma	<input type="checkbox"/> Housing Built Before 1970
<input type="checkbox"/> Non-English Speaking	<input type="checkbox"/> Mobile Homes
<input type="checkbox"/> All	

Additional Concerns How many? 1

Clip copy of original file selected above?
Select a polygon layer to be used for clipping:

Specify The Output Shapefile or Feature Layer
C:\Documents and Settings\kelly\Application Data\IE

Help Cancel Next >

•Select feature class to assess.

•Check demographic concerns or choose to add additional concerns.

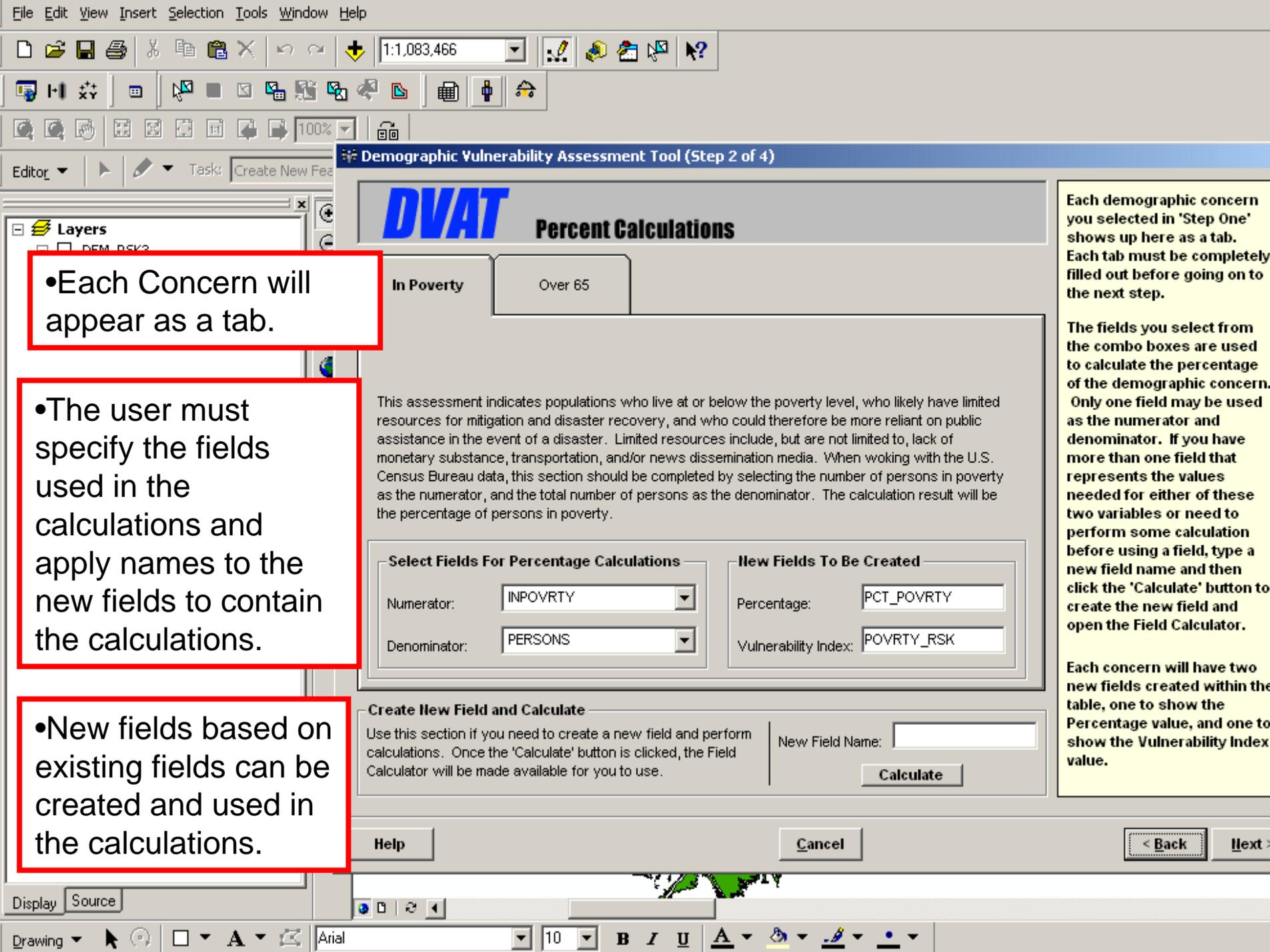
•Choose to clip to feature class if desired.

•Save the output feature class to a drive location.

Select the original demographic file that you will be working with from the top-most combo box.

Each demographic concern being completed should have the box next to it checked.

If you would like the new shapefile to be clipped to another layer, use this option. First click the checkbox, then select the appropriate layer from the combo box.



Demographic Vulnerability Assessment Tool (Step 2 of 4)

DVAT

Percent Calculations

In Poverty Over 65

This assessment indicates populations who live at or below the poverty level, who likely have limited resources for mitigation and disaster recovery, and who could therefore be more reliant on public assistance in the event of a disaster. Limited resources include, but are not limited to, lack of monetary substance, transportation, and/or news dissemination media. When working with the U.S. Census Bureau data, this section should be completed by selecting the number of persons in poverty as the numerator, and the total number of persons as the denominator. The calculation result will be the percentage of persons in poverty.

Select Fields For Percentage Calculations

Numerator:

Denominator:

New Fields To Be Created

Percentage:

Vulnerability Index:

Create New Field and Calculate

Use this section if you need to create a new field and perform calculations. Once the 'Calculate' button is clicked, the Field Calculator will be made available for you to use.

New Field Name:

Each demographic concern you selected in 'Step One' shows up here as a tab. Each tab must be completely filled out before going on to the next step.

The fields you select from the combo boxes are used to calculate the percentage of the demographic concern. Only one field may be used as the numerator and denominator. If you have more than one field that represents the values needed for either of these two variables or need to perform some calculation before using a field, type a new field name and then click the 'Calculate' button to create the new field and open the Field Calculator.

Each concern will have two new fields created within the table, one to show the Percentage value, and one to show the Vulnerability Index value.

•Each Concern will appear as a tab.

•The user must specify the fields used in the calculations and apply names to the new fields to contain the calculations.

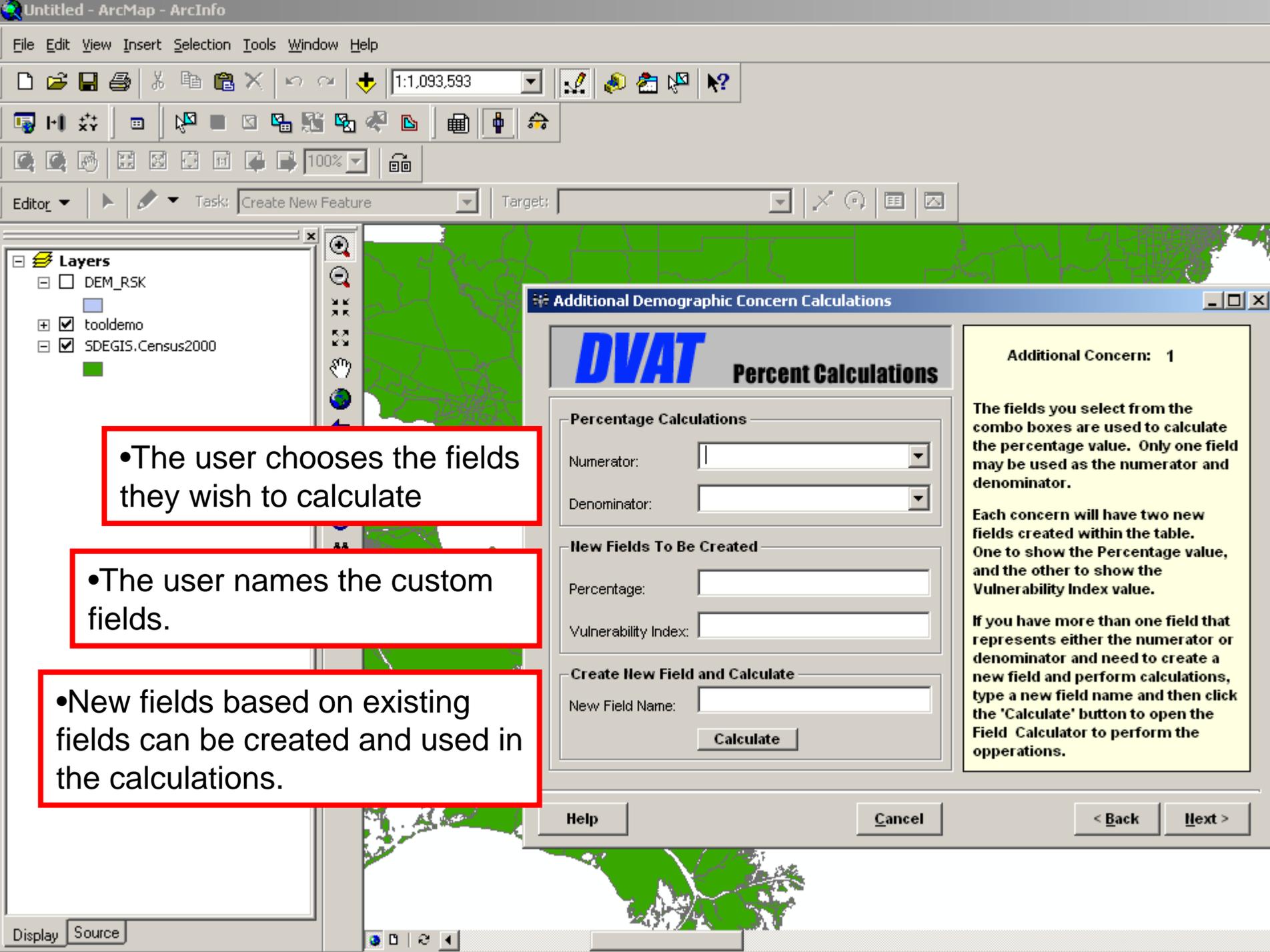
•New fields based on existing fields can be created and used in the calculations.

Help

Cancel

< Back

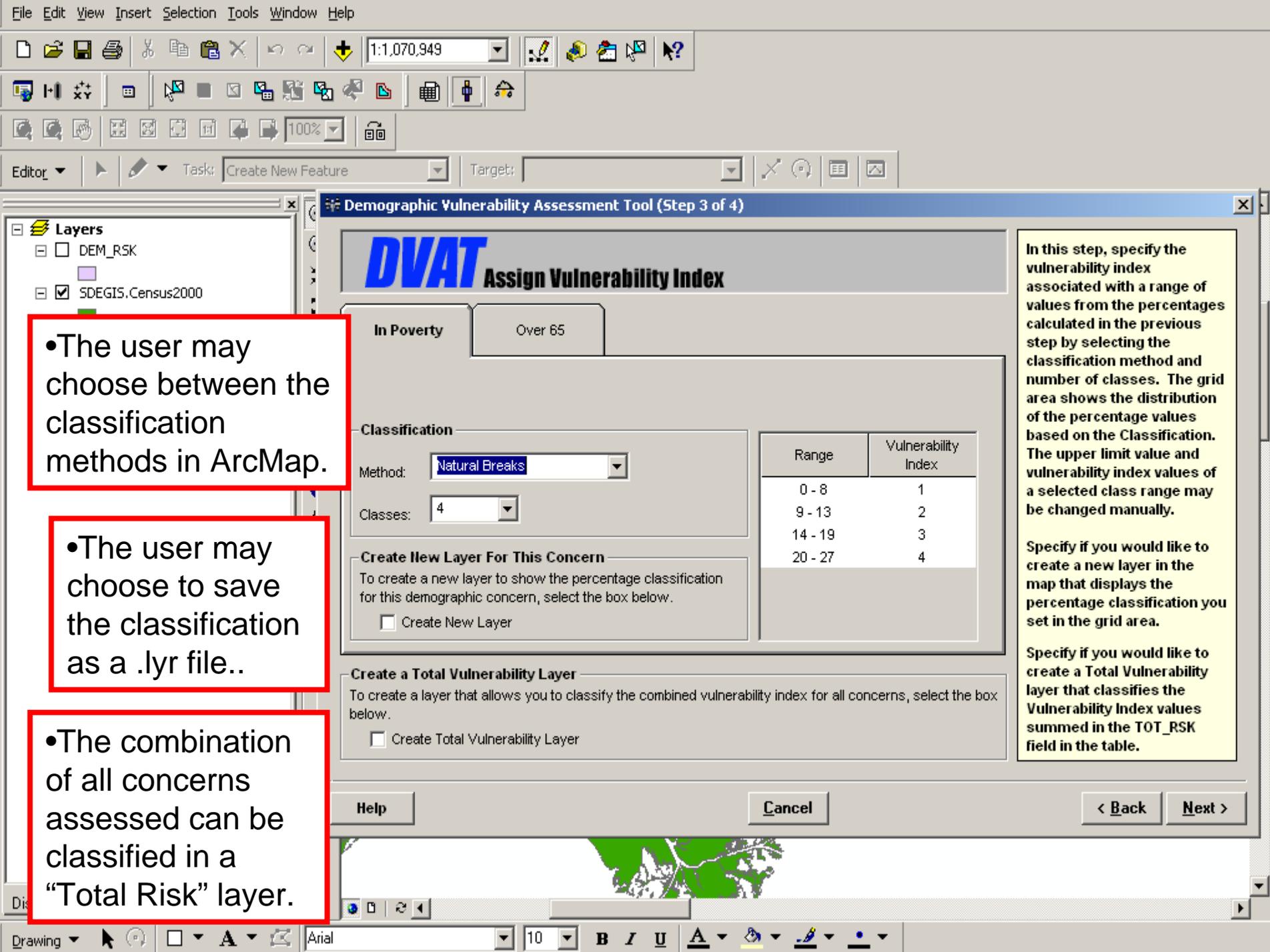
Next >



•The user chooses the fields they wish to calculate

•The user names the custom fields.

•New fields based on existing fields can be created and used in the calculations.



•The user may choose between the classification methods in ArcMap.

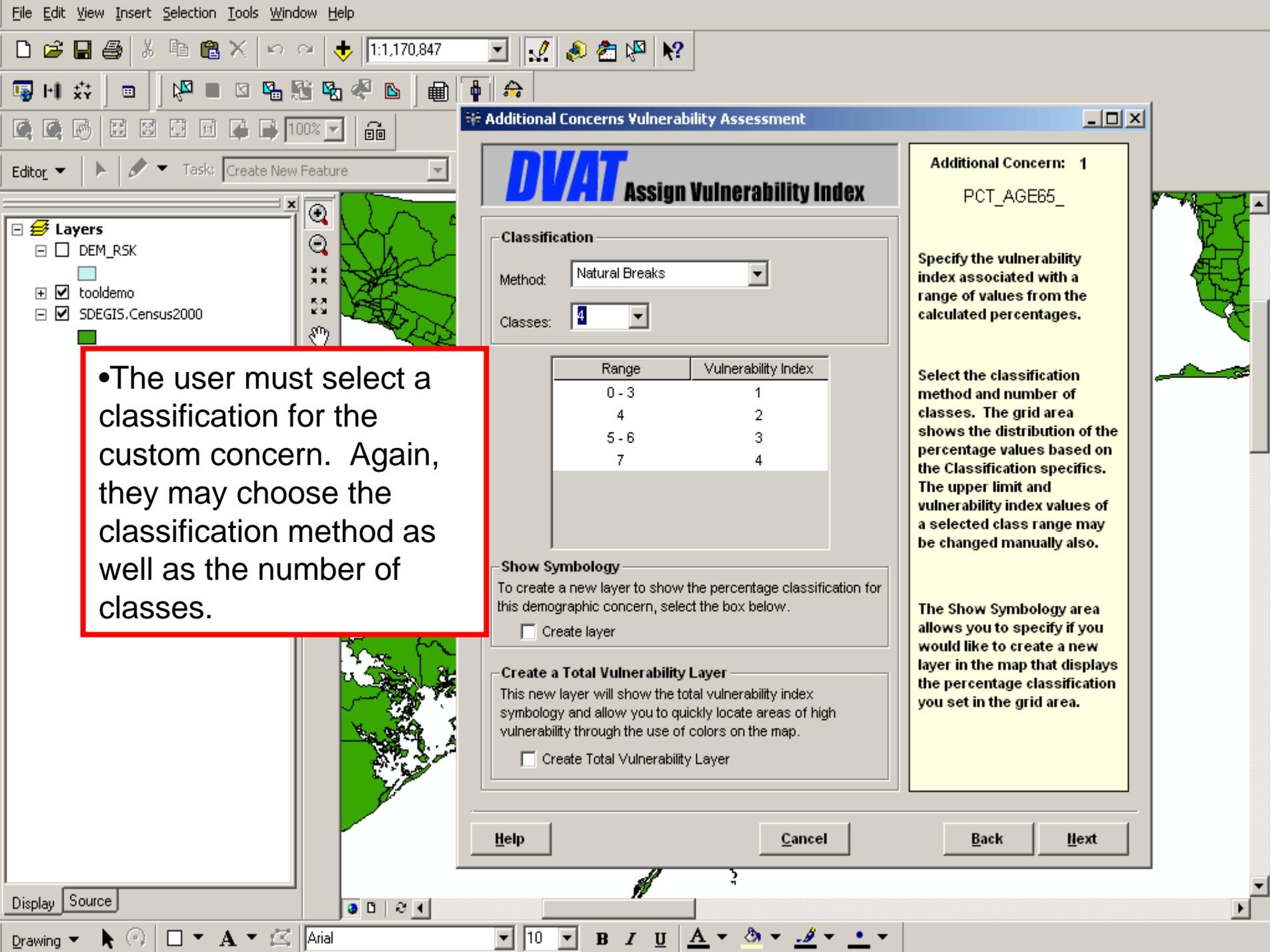
•The user may choose to save the classification as a .lyr file..

•The combination of all concerns assessed can be classified in a "Total Risk" layer.

In this step, specify the vulnerability index associated with a range of values from the percentages calculated in the previous step by selecting the classification method and number of classes. The grid area shows the distribution of the percentage values based on the Classification. The upper limit value and vulnerability index values of a selected class range may be changed manually.

Specify if you would like to create a new layer in the map that displays the percentage classification you set in the grid area.

Specify if you would like to create a Total Vulnerability layer that classifies the Vulnerability Index values summed in the TOT_RSK field in the table.



Additional Concerns Vulnerability Assessment

DVAT Assign Vulnerability Index

Classification

Method: Natural Breaks

Classes: 4

Range	Vulnerability Index
0 - 3	1
4	2
5 - 6	3
7	4

Show Symbology
To create a new layer to show the percentage classification for this demographic concern, select the box below.

Create layer

Create a Total Vulnerability Layer
This new layer will show the total vulnerability index symbology and allow you to quickly locate areas of high vulnerability through the use of colors on the map.

Create Total Vulnerability Layer

Buttons: Help, Cancel, Back, Next

Additional Concern: 1
PCT_AGE65_

Specify the vulnerability index associated with a range of values from the calculated percentages.

Select the classification method and number of classes. The grid area shows the distribution of the percentage values based on the Classification specifics. The upper limit and vulnerability index values of a selected class range may be changed manually also.

The Show Symbology area allows you to specify if you would like to create a new layer in the map that displays the percentage classification you set in the grid area.

•The user must select a classification for the custom concern. Again, they may choose the classification method as well as the number of classes.

Layers

- DEM_RSK
- tooldemo
- SDEGIS.Census2000



Coastal Risk Atlas



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Vulnerability Maps

• GIS Maps

Coastal Resources

CRA Tutorial

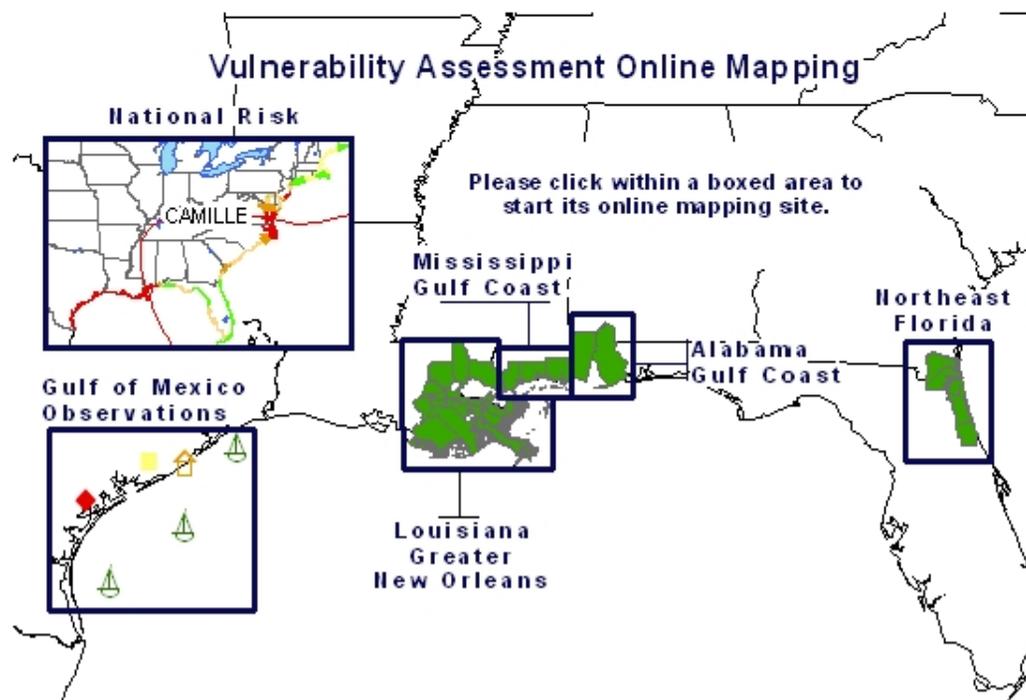
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Participants

FAQs

Vulnerability Assessment Online Mapping



Warning: Problems may occur when using older versions of Internet Explorer and Netscape to view these sites.



Coastal Risk Atlas



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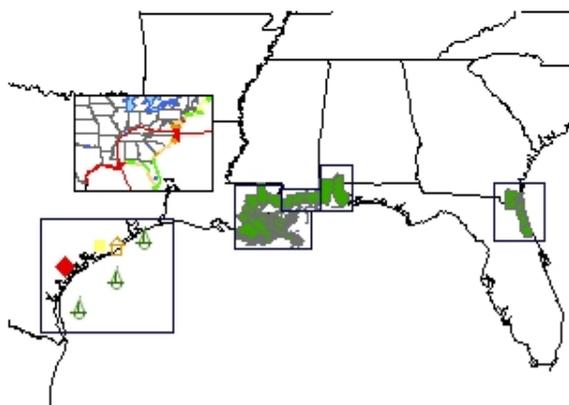
Collaborative Tools

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FAQs

Vulnerability Maps:



The Vulnerability Mapping page contains links for the Coastal Risk Atlas ArcIMS sites.

This site does not request any internet downloads or plug-ins. The map viewer application can only be viewed with Microsoft Internet Explorer 5.5 or greater or Netscape 4.8 or greater. The client's browser must have Javascripting enabled, and be able to handle graphics and frames.

Alabama

The Alabama Map Service covers Baldwin and Mobile County in Coastal Alabama. The data layers present include hazard and demographic layers necessary for assessing community vulnerability as well as data representing the



Coastal Risk Atlas



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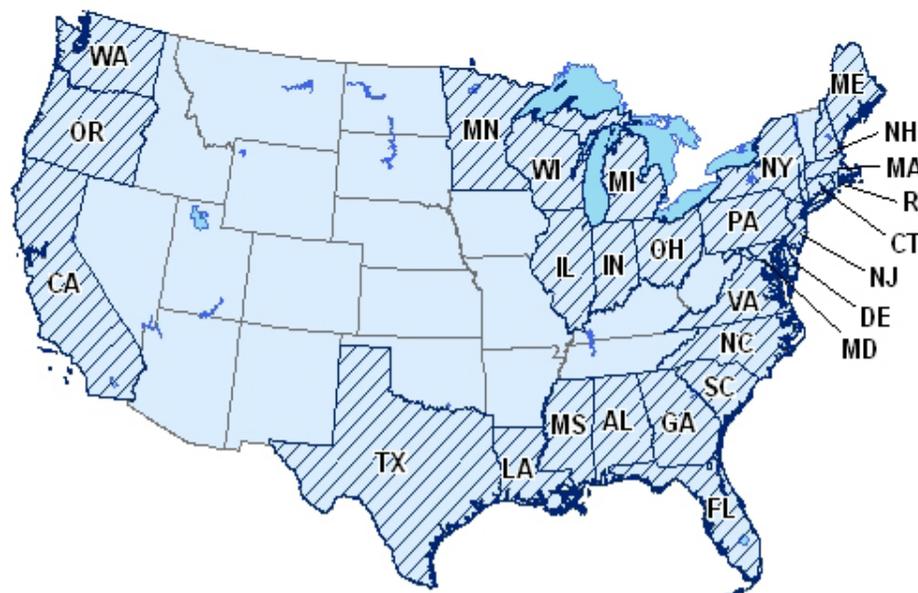
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Choose State

Note: Some pages may link to locations outside the US Department of Commerce.



[General Links](#) ▲

[Coast Survey's nowCOAST](#)



Coastal Risk Atlas



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What is Vulnerability Assessment?

Hazard Identification

The first step in the vulnerability assessment process involves determining which hazards are of greatest concern. Risk scores are assigned based on the threat the hazard poses to the community. These are the hazards addressed in the Coastal Risk Atlas.

- Storm Surge
- Wind
- Flood
- Tornado
- Habitat Loss
- Hazardous Spills
- Toxic Release





Coastal Risk Atlas



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Document Library

The document library contains papers and briefs referenced to the Coastal Risk Atlas.

Assessing the Vulnerability of the Mississippi Gulf Coast to Coastal Storms Using an On-Line GIS-Based Coastal Risk Atlas

A Conceptual discussion



Photo Courtesy of NASA



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- What is vulnerability assessment in the context of the Coastal Risk Atlas?**
- Why conduct vulnerability assessments?**
- Is knowledge in geographic information systems (GIS) necessary?**
- Who will use the Coastal Risk Atlas?**
- What coastal areas have completed online assessments?**
- Where is the Coastal Risk Atlas expected to expand next?**

What is vulnerability assessment in the context of the Coastal Risk Atlas? (back to top)

Vulnerability assessment is the process of identifying potential hazards associated with a particular locality and the determination of the threats to the natural environment, the community infrastructure, and socio-economic well being of the area. More information about the vulnerability assessment process can be found in the **Community Vulnerability Assessment Tool (CVAT)** developed by [NOAA's Coastal Services Center \(CSC\)](#).

Why conduct vulnerability assessments? (back to top)

As coastal areas are particularly susceptible to hazards, it is important that communities have a good understanding of the relationship between coastal hazards and vulnerable factors.

Is knowledge in geographic information systems (GIS) necessary? (back to top)

To ease the process involved in conducting a vulnerability assessment, two decision support tools are in development to aid users in assessing their risks. The tools, in wizard form, will step the user through the process of manipulating, calculating, and scoring hazard and demographic data.



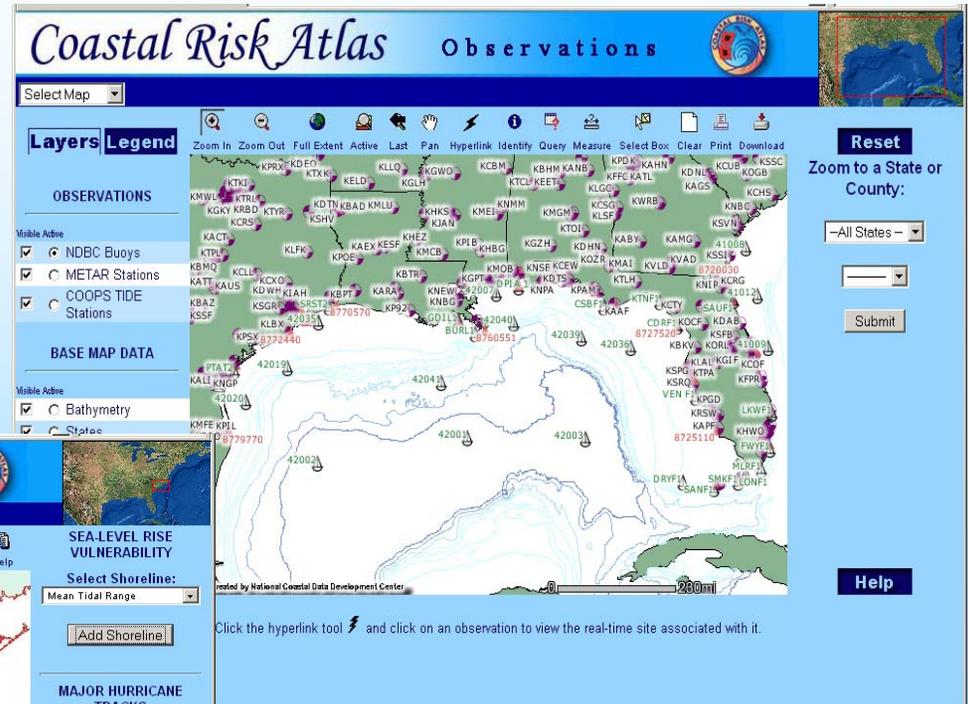
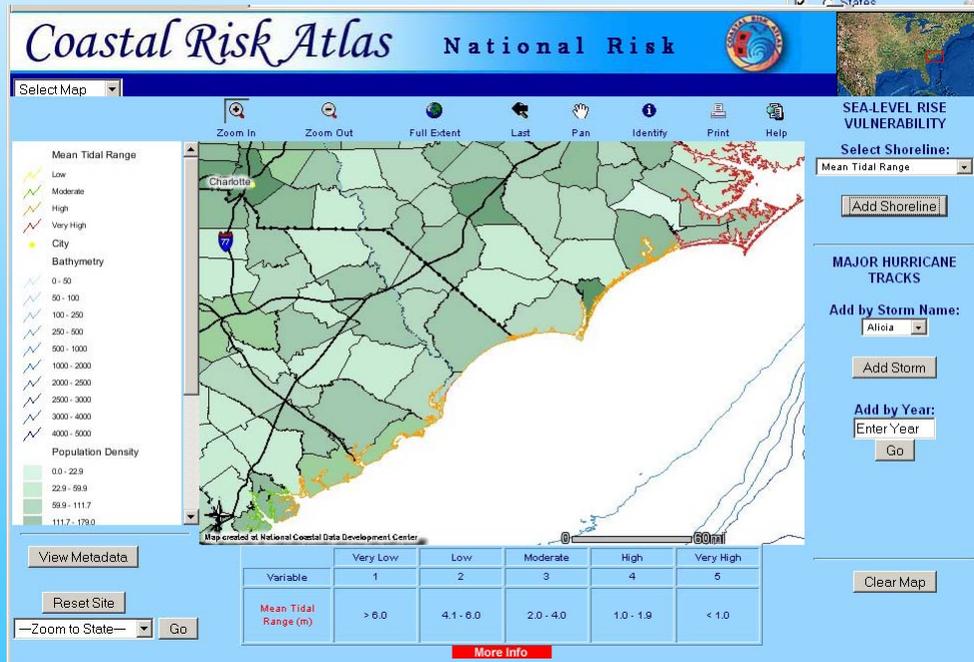
Online Mapping

- Allows users who lack GIS software to view, query, and identify the data layers.
- Serves as a method of viewing the data before download
- Potential home buyers, local residents, etc. can assess their vulnerability to coastal storms.



National Vulnerability

- Sealevel Rise
- Population Density



Observations

- Links to real-time observations
- Forecasts



Data Sets in ArcIMS

Critical Facilities

- Police Stations
- Fire Stations
- Communication Systems
- Airports
- EPA Regulated Sites
- Hospitals
- Schools

Base Map Data

- Roads
- Evacuation Routes
- Railroads
- Streams
- Water
- Wetlands
- LULC

Municipal Boundaries

- Cities
- Counties
- Evacuation Zones
- States

Hazard Analysis Data

- Combined Vulnerability
- Storm Surge
- FEMA Q3
- Wind Envelopes
- Census Data



Select Map

Layers Legend

CRITICAL FACILITIES

Zoom in to view layers.

Visible Active

- ? Police Station
- ? Fire Department
- ? Communication Systems
- ? Airport
- ? EPA Regulated Sites
- ? Hospital
- ? School

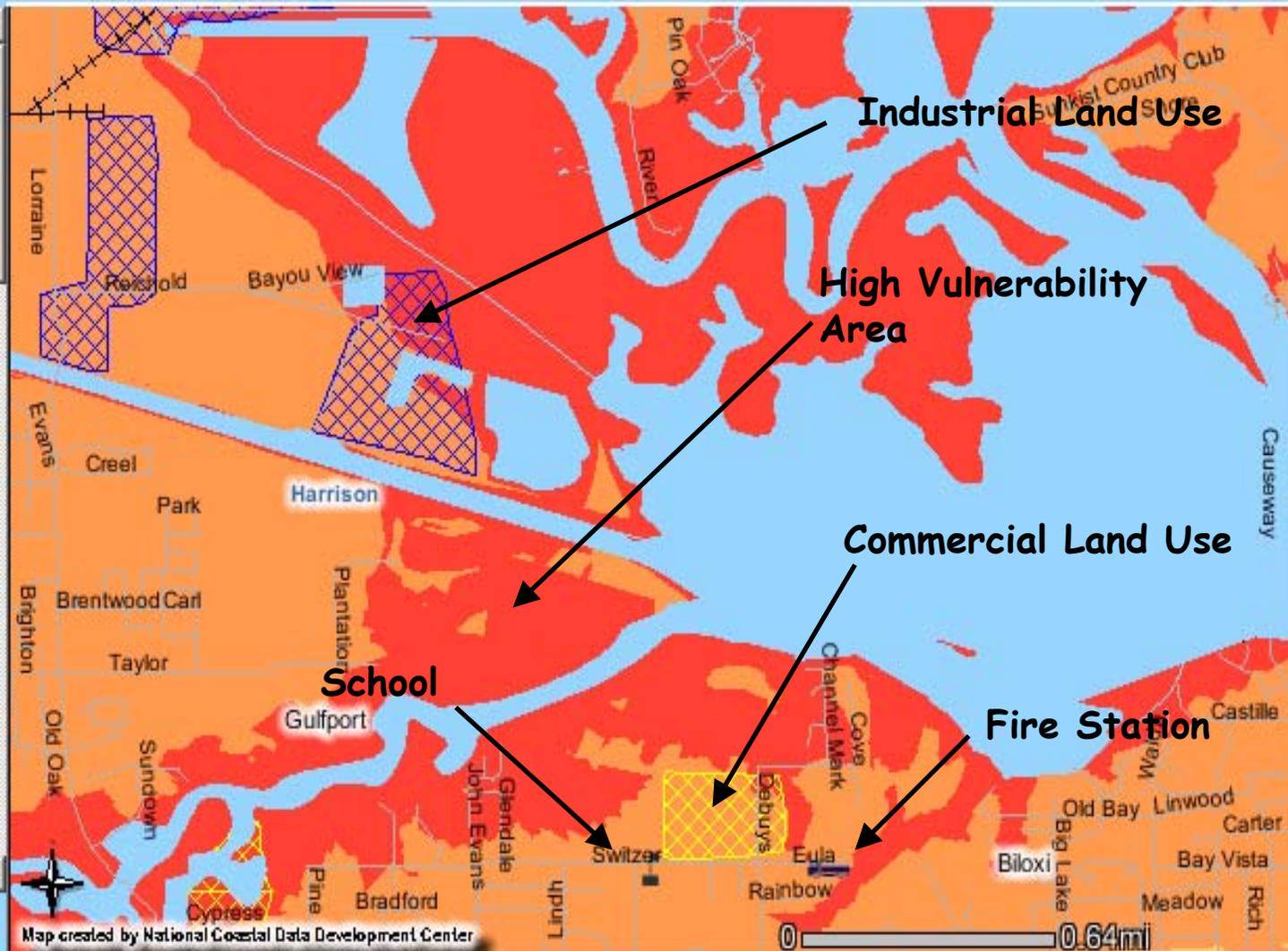
BASE MAP DATA

Visible Active

- ? Road
- ? Evacuation Route
- ? Railroad
- ? Street

Refresh

- Zoom In
- Zoom Out
- Full Extent
- Active
- Last
- Pan
- Identify
- Query
- Measure
- Select Box
- Clear
- Print
- Download





Select Map

- Zoom In
- Zoom Out
- Full Extent
- Active
- Last
- Pan
- Identify
- Query
- Measure
- Select Box
- Clear
- Print
- Download

Layers Legend

DEMOGRAPHIC LAYERS

Turn on one at a time.

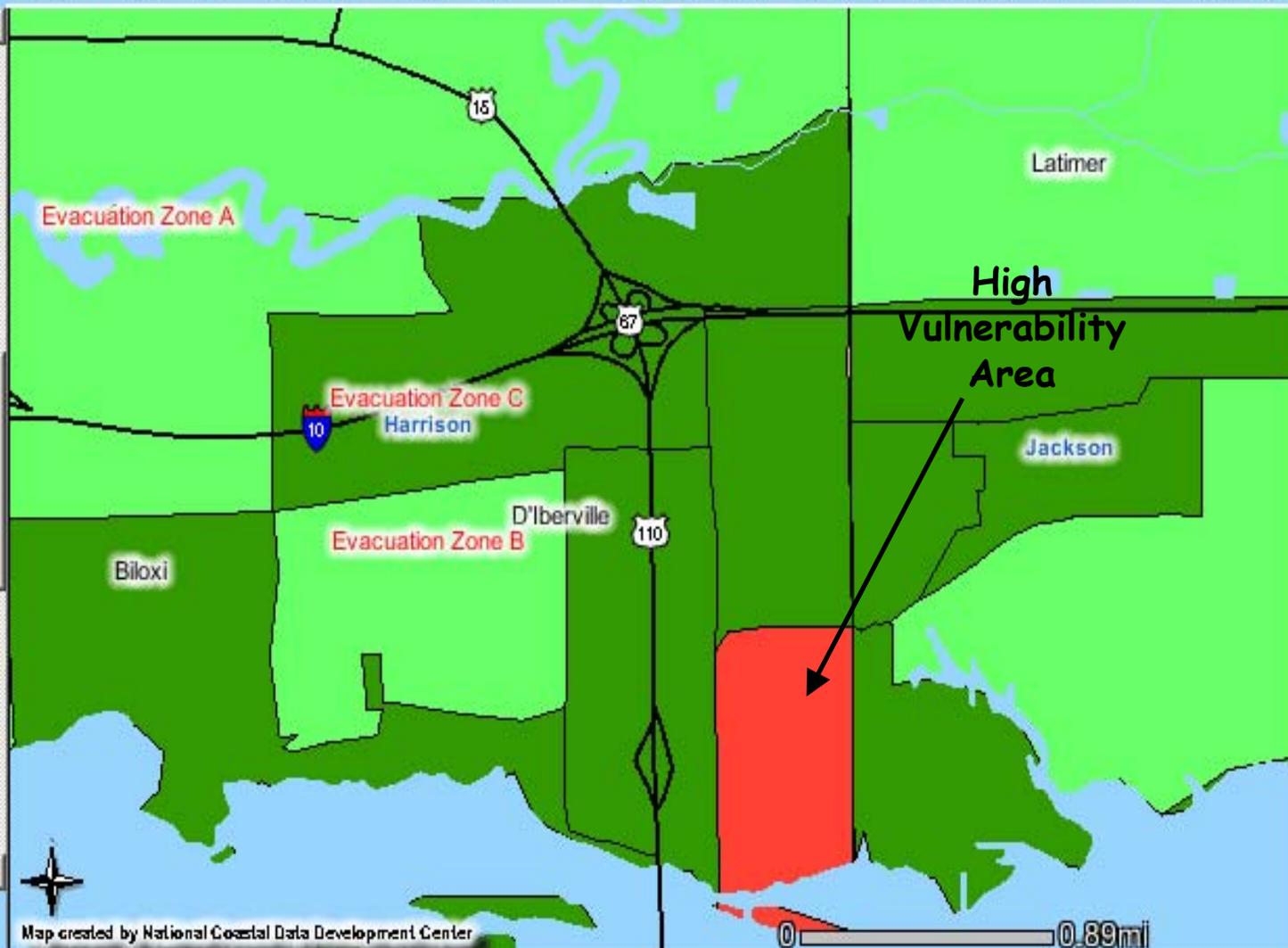
Visible Active

- ? Societal Risk
- ? Percent Single w/ Child
- ? Percent Public Assistance
- ? Percent Mobile Homes
- ? Percent Pre 1970 Structures
- ? Percent No Vehicle
- ? Percent Rental Units
- ? Percent No Diploma
- ? Percent in Poverty
- ? Percent Over 65
- ? Percent No English

LAND USE

Zoom in to view layers.
Turn on over hazard layers.

Refresh





Select Map

Zoom In Zoom Out Full Extent Active Last Pan Identify Query Measure Select Box Clear Print Download

Layers Legend

CRITICAL FACILITIES

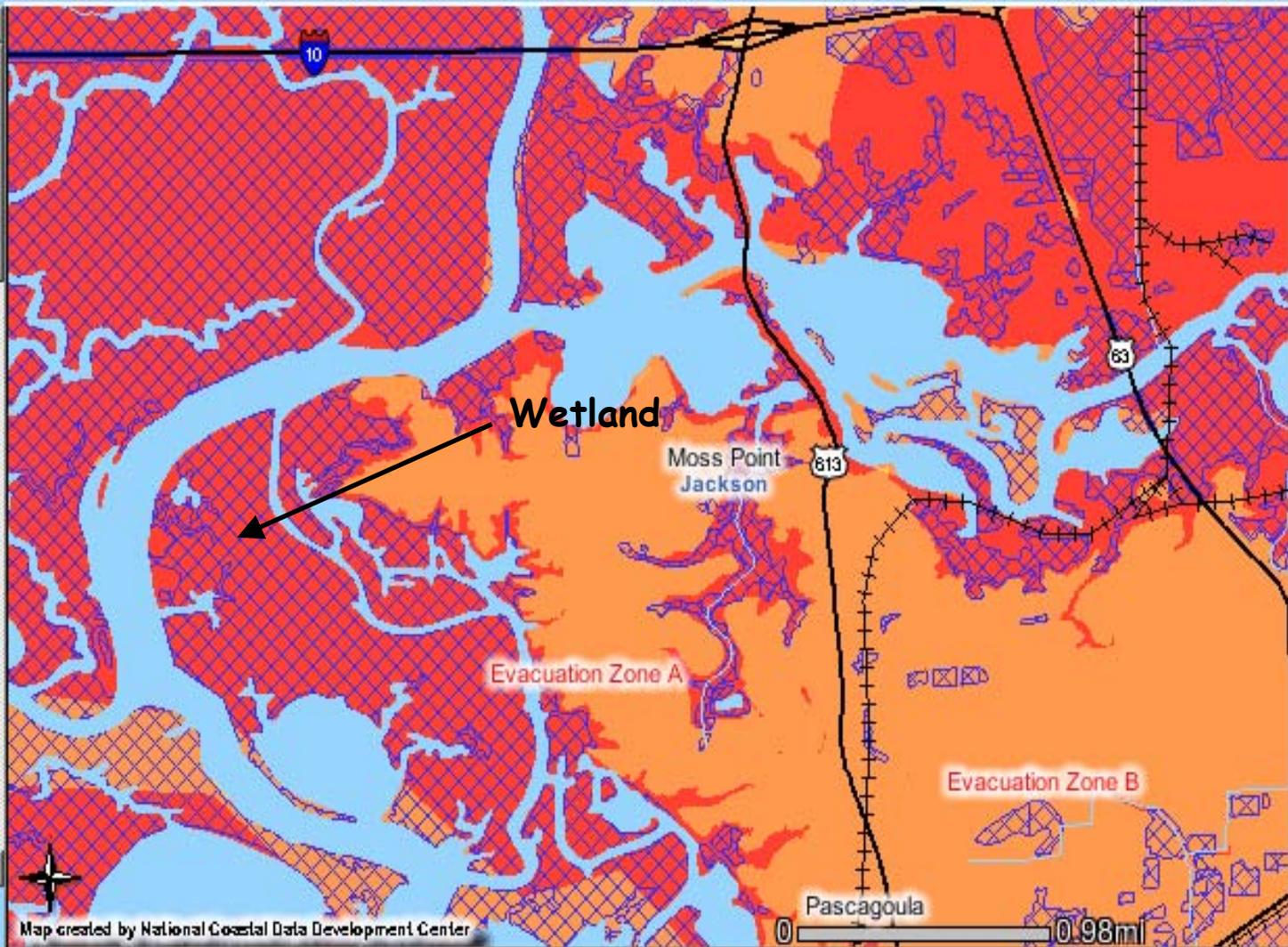
Zoom in to view layers.

- Visible Active
- ? Police Station
 - ? Fire Department
 - ? Communication Systems
 - ? Airport
 - ? EPA Regulated Sites
 - ? Hospital
 - ? School

BASE MAP DATA

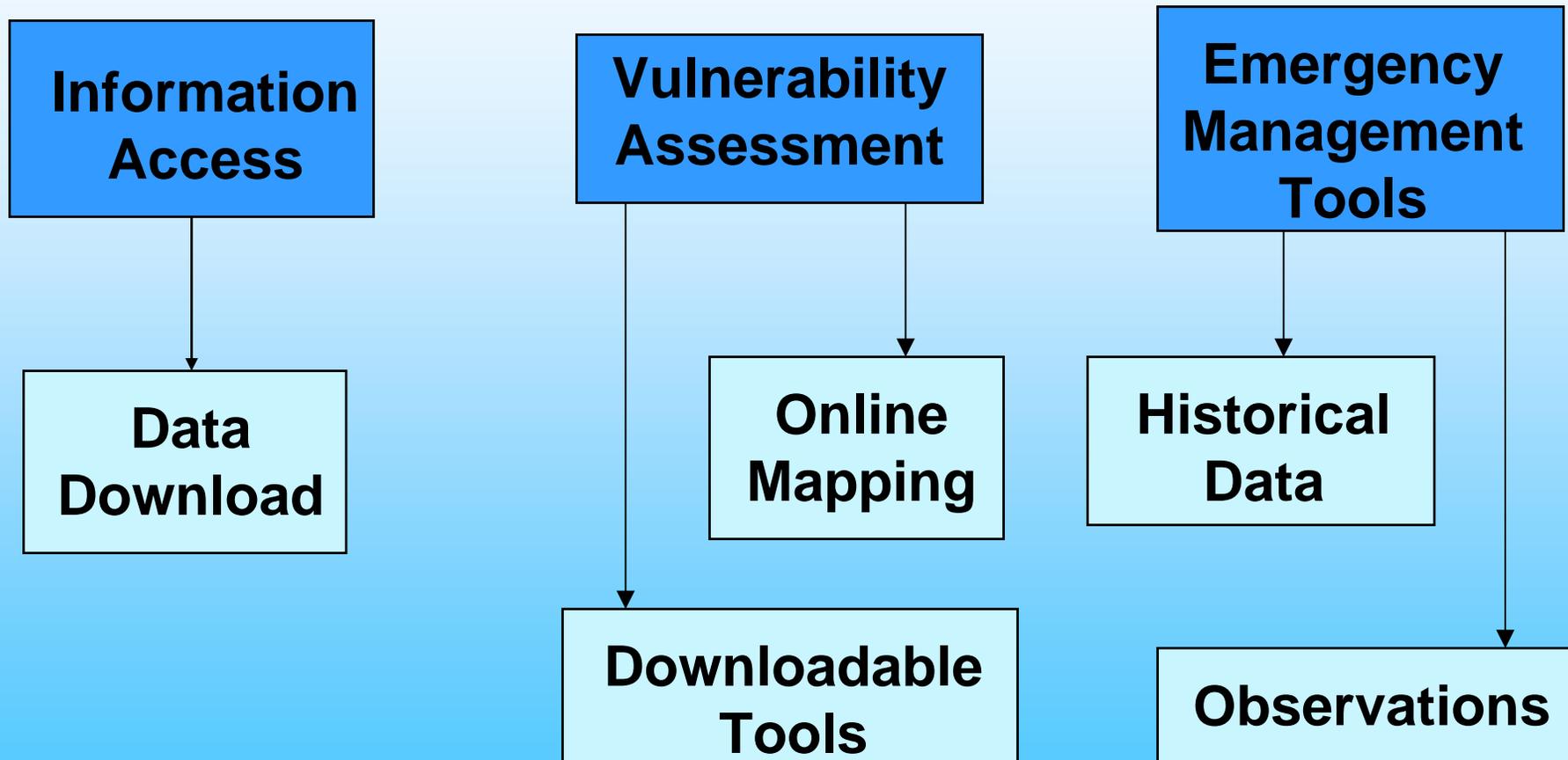
- Visible Active
- ? Road
 - ? Evacuation Route
 - ? Railroad
 - ? Street

Refresh





CRA Framework





NOAA Satellites and Information

National Environmental Satellite, Data, and Information Service



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The Coastal Risk Atlas is a vulnerability assessment resource used to determine a community's susceptibility to coastal storms. The data depicted include static hazard model outputs, data representing the critical infrastructure, and demographics to show the locations of vulnerable populations.

Featured GIS Site on ESRI's GIS.com



NOAA Satellites and Information

National Environmental Satellite, Data, and Information Service



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