



# ECOLOGICAL RESEARCH PROGRAM

BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

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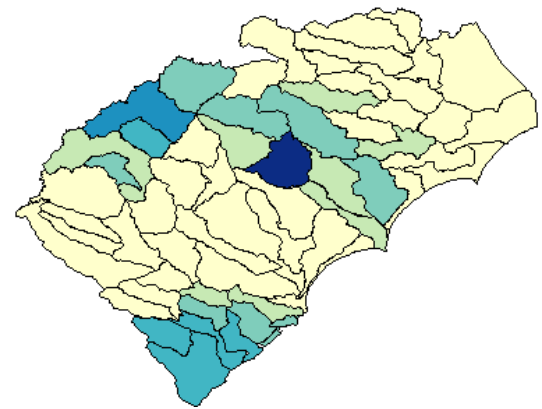
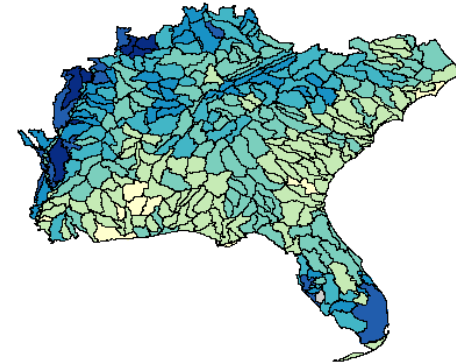
## *Coastal Carolinas Environmental Decision Toolkit (EDT) Overview*

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**Research Triangle Park, NC**

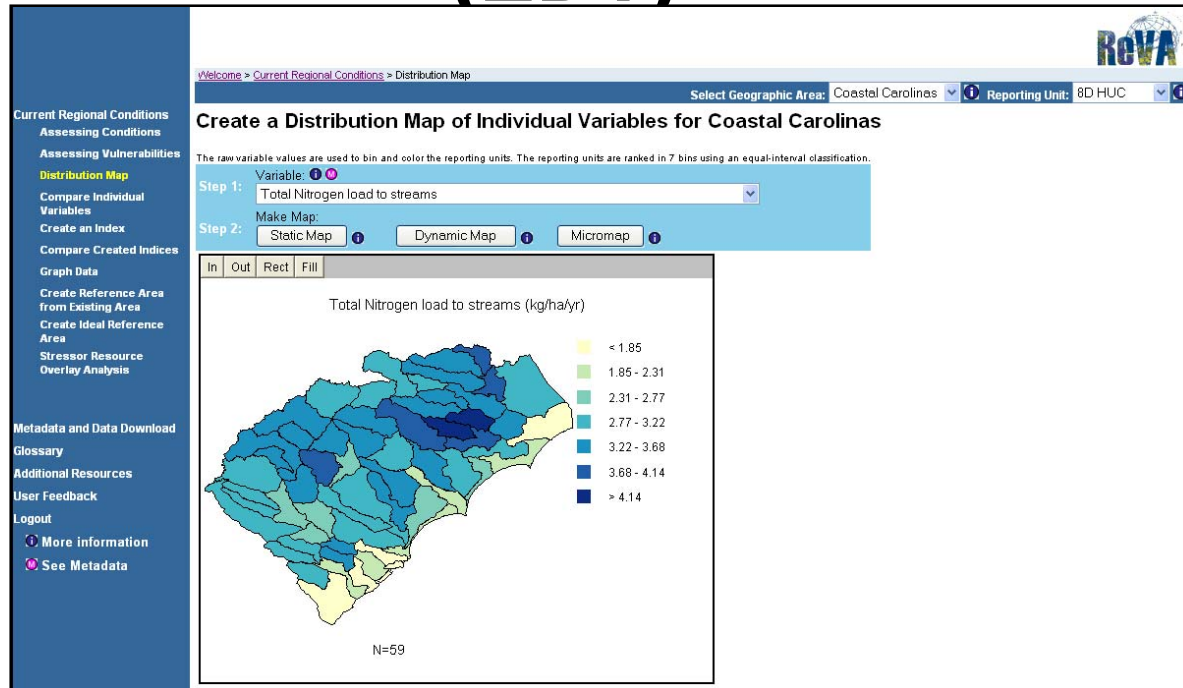


## Toolkit creation and capabilities

- Created as a Subset of Region 4 EDT
- Current Variables: People (33), Air (30), Water (13), Terrestrial (35), Multiple Categories (37)
- Static and Interactive Mapping
- Multi-variable integration
- Multiple perspectives on environmental conditions (endpoints, scales)
- Insight into current status and potential future problems

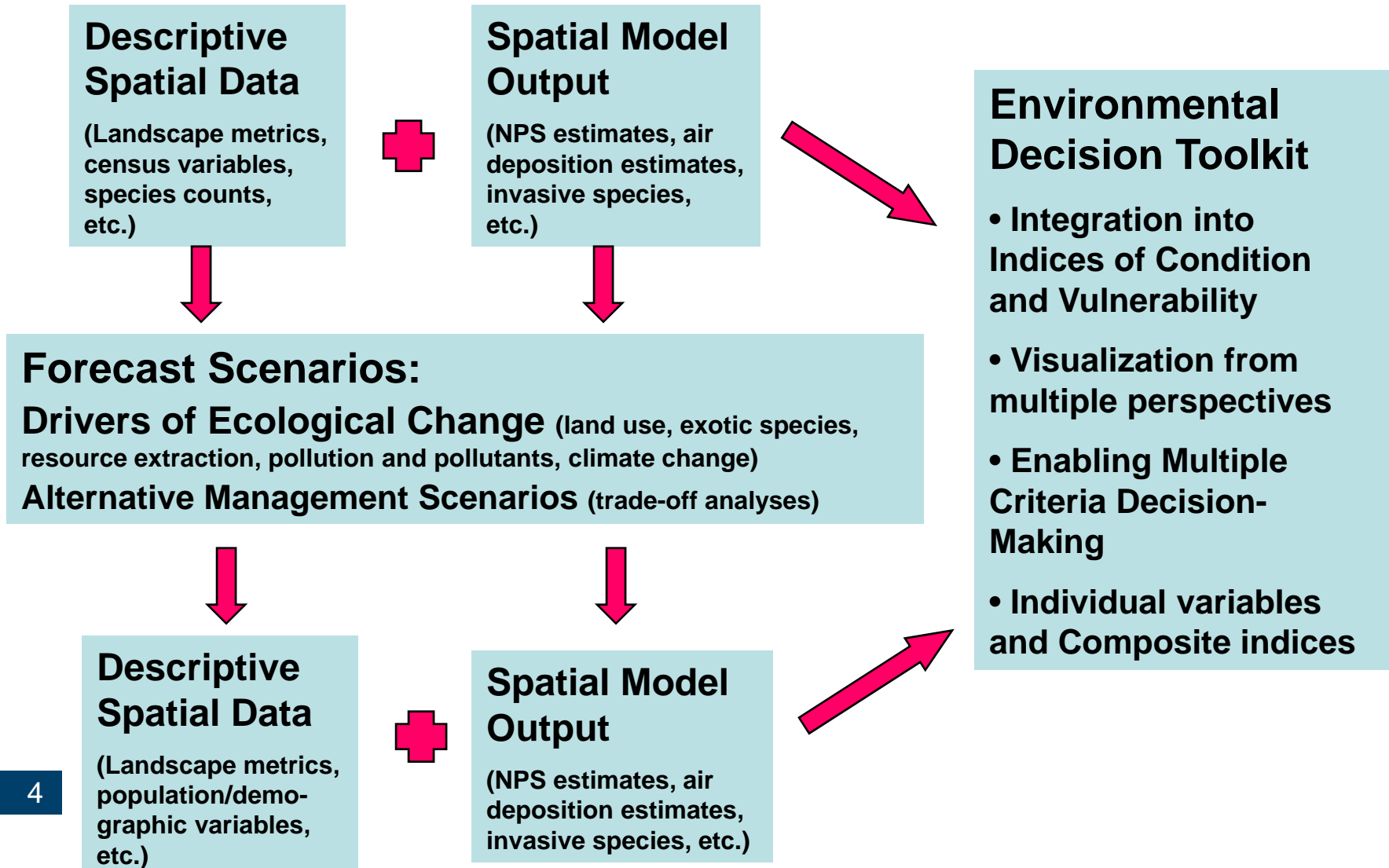


# ReVA Environmental Decision Toolkit (EDT)



- Web-based toolkit
- Single variable views
- Multivariable views
- Relations between variables
- Integration of indicator variables
- Interoperability with other utilities
- Future scenarios and trade offs – coming soon

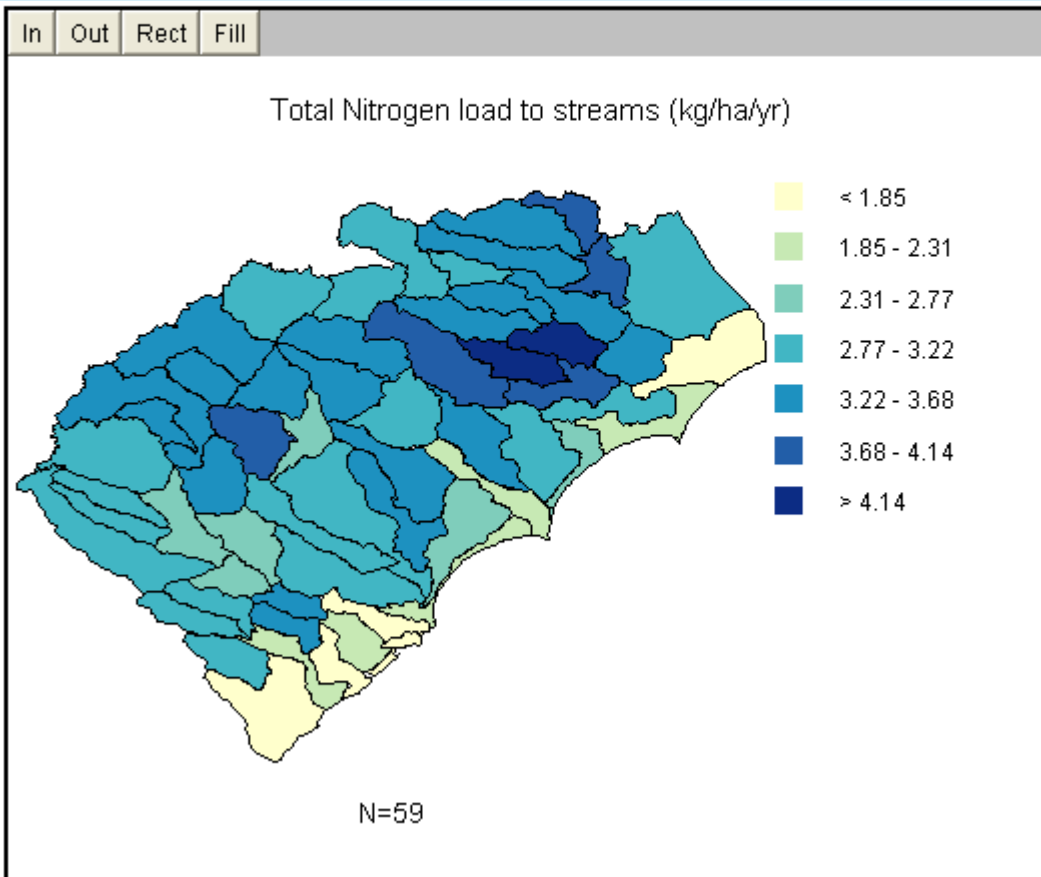
## ReVA Process



# Distribution Maps

Step 1: Variable: i m  
Total Nitrogen load to streams

Step 2: Make Map:  
 i  i  i



**Available in  
static, interactive  
or micro maps**

## Interactive Maps

Welcome > Current Regional Conditions > Distribution Map

Select Geographic Area: Coastal Carolinas | Reporting Unit: 8D HUC

### Create a Distribution Map of Individual Variables for Coastal Carolinas

The raw variable values are used to bin and color the reporting units. The reporting units are ranked in 7 bins using an equal-interval classification.

Variable: Total NOx deposition (CMAQ)

Step 1: Total NOx deposition (CMAQ)

Step 2: **Dynamic Map** | Static Map | Micromap

Region=Northeast Cape Fear  
 Total NOx deposition (CMAQ) (kg/ha)

Bin	Range (kg/ha)
1	< 8.46
2	8.46 - 10.84
3	10.84 - 13.21
4	13.21 - 15.58
5	15.58 - 17.96
6	17.96 - 20.33

Watershed Details  
 All Watersheds - data for TOT.NOX  
 Radar plot for watershed  
 Google Earth  
 Digital Watershed

N=59

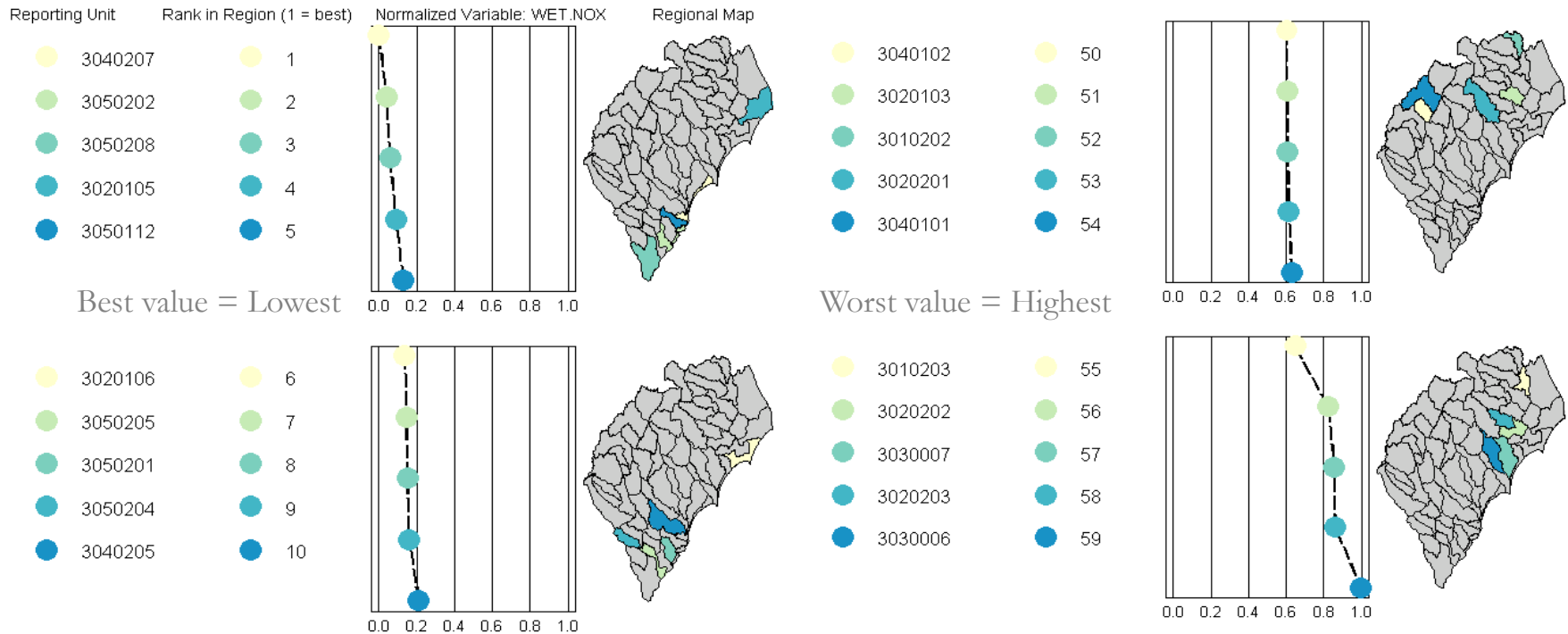
*Total (wet and dry) NOx Deposition from CMAQ 2002*

Clicking on an individual HUC in interactive mode brings up a menu of options for drilling down into watershed, data, or spatial details

STATS / GRAPHS POWERED BY **Insightful**

## Distribution displayed using Linked Micro Maps

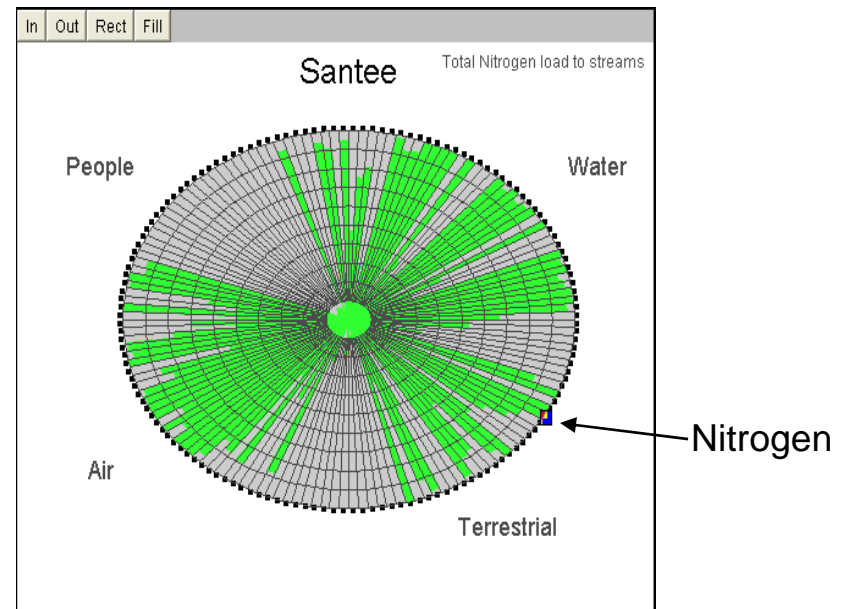
- Display best and worst watersheds by variable
- Combine spatial and statistical views of variables



**Nitrogen values**

Total Agriculture (Pasture + Crop) on > 3% Slope	AGTSL3	%	0.2048	0.0086
Total American Eskimo population	AMERI.ES	Count	275.0000	0.9952
Total Area Protected Lands	PAD.HA	Hectares	71075.6378	0.6505
Total Area Protected Lands within 10km of point source emitting > 1T	NEIPAD.HA	Hectares	0.0000	0.0000
Total Asian population	ASIAN	Count	971.0000	0.9652
Total Hawaiian population	HAWN.PI	Count	45.0000	0.9417
Total Hispanic population	HISPANIC	Count	1798.0000	0.9731
Total NOx deposition (CMAQ)	TOT.NOX	kg/ha	7.9118	0.1096
Total Nitrogen load to streams	N.LOAD	kg/ha/yr	1.3966	0.0000
Total Phosphorus load to streams	P.LOAD	kg/ha/yr	0.2006	0.0000
Total SOx deposition (CMAQ)	TOT.SOX	kg/ha	11.8114	0.5364

- **Watershed Variable Table**
- **Radar Plots – shows all variables at once**





## Multiple Variable Integration



[Welcome](#) > [Current Regional Conditions](#) > Assessing Conditions

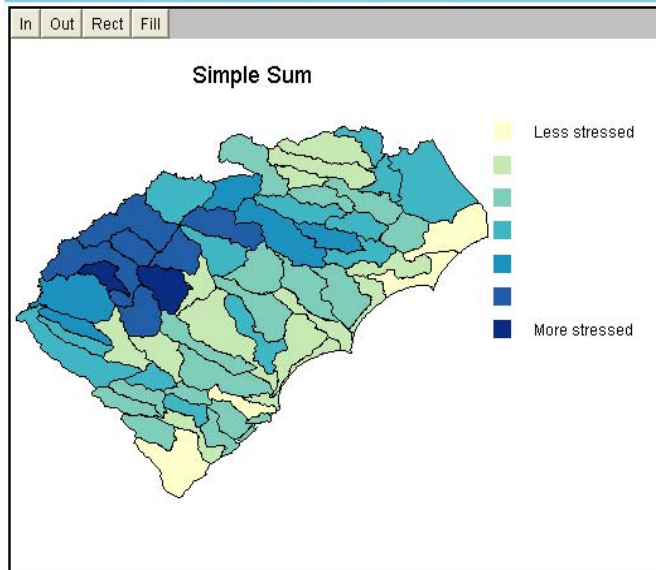
Select Geographic Area: Coastal Carolinas ⌵ Reporting Unit: 8D HUC ⌵ ⓘ

### Assess Conditions for Coastal Carolinas

This section creates a map of integration methods that inform the user of overall conditions in the reporting units. For detailed information on the different types of integration methods click on the information button next to the "Choose Integration Method" drop down box. The titles of the maps in this section are given as the selected integration method. (e. g. Simple Sum). The legend lists the possible colors from less stressed to more stressed. Reporting units are colored appropriately based on the outcome of the selected integration method. Since this is an integration method, normalized indicator values are used and no values are displayed.

Step 1: Choose Integration method: ⓘ ⓘ  
 ⌵

Step 2: Make Map:  
 ⓘ  ⓘ



- Current Regional Conditions
- Assessing Conditions
- Assessing Vulnerabilities
- Distribution Map
- Compare Individual Variables
- Create an Index
- Compare Created Indices
- Graph Data
- Create Reference Area from Existing Area
- Create Ideal Reference Area
- Stressor Resource Overlay Analysis

- Metadata and Data Download
- Glossary
- Additional Resources
- User Feedback
- Logout
- More information ⓘ
- See Metadata ⓘ

## Creating an Index

Weight the variables and then create a map. [?](#)

Step 1:

		0	1	2	3	4	5	6	7	8	9	10
Number of housing units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Percent impervious surface	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Percent urban cover	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Total population year 2005	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Step 2:

Make Map:

[?](#)  [?](#)

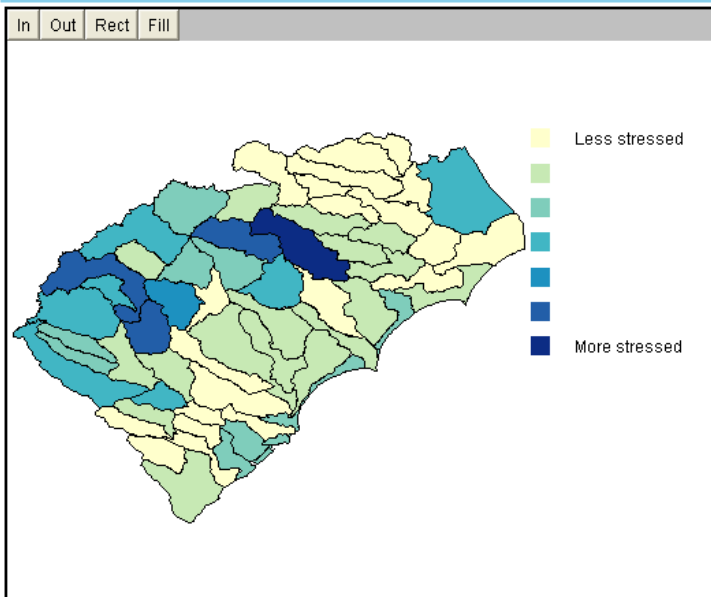
Save Profile Name:   [?](#)  [?](#)

[?](#)

**Select variables and add subjective values**

**Examples:**

- Water Quality
- Air Quality
- Human Health
- Management Priorities, e.g. BMP placement

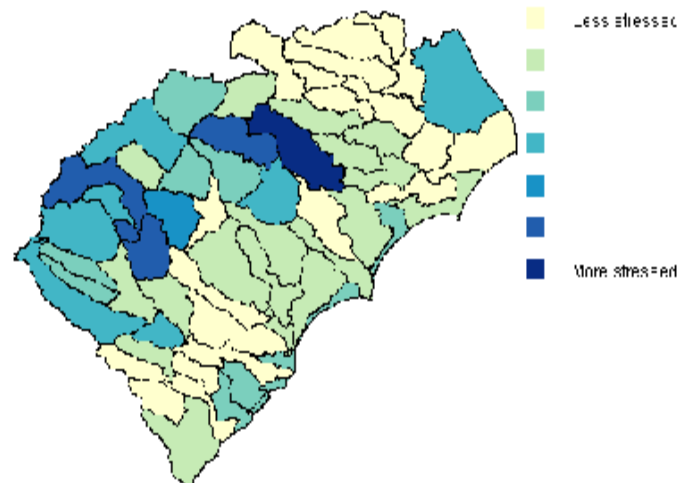
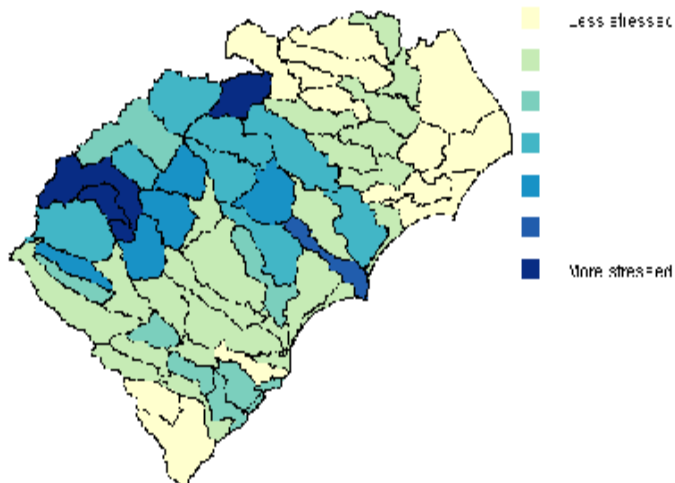


## Comparing Indices: two different assessments of water quality

Step 1: Select 1st Profile : ⓘ  ▼

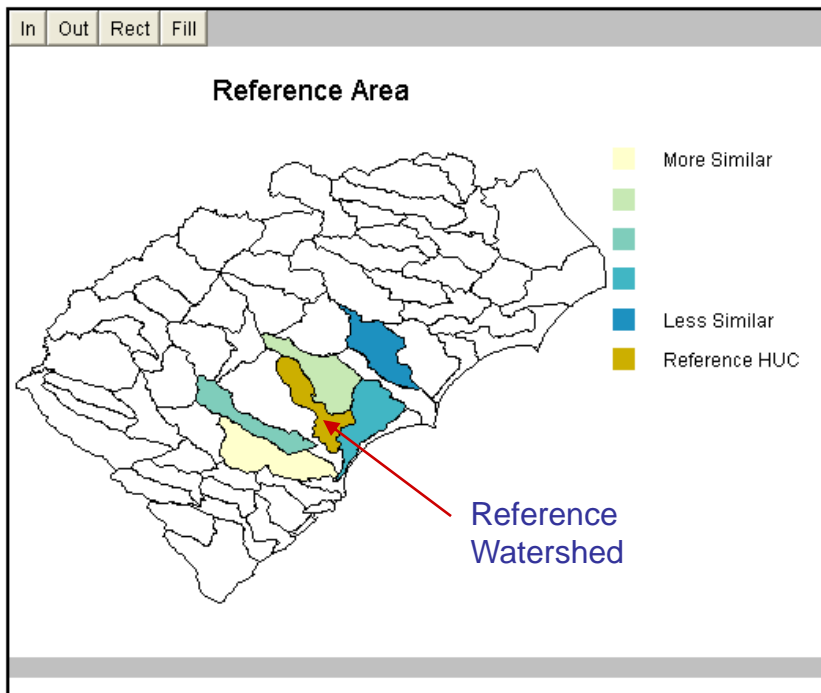
Step 2: Select 2nd Profile : ⓘ  ▼

Step 3: Create Graph  ⓘ



## Creating Reference Areas

- 3 Integration methods currently available
- Existing Watershed or Ideal Reference using available variables



- Measures the multivariate *distance* between a reference watershed's suite of variables and the same suite of variables for other watersheds (top 5 or all).
- Sustainability or other goals can be used to define the reference: providing a report card on where individual watersheds stand
- Can be used to identify similar watersheds

**Step 2: Select Stressor Variable(s)**

Available Stressor Variables

- Air concentration of Antimony Compounds
- Air concentration of Arsenic Compounds
- Air concentration of Beryllium Compounds
- Air concentration of Bis (2 ethylhexyl) Phthalate (DEHP)
- Air concentration of Cadmium
- Air concentration of Chromium3 Compounds
- Air concentration of Cobalt

Selected Stressor Variables

- Total road density
- Total roads crossing streams per kilometer stream
- Total NOx deposition (CMAQ)
- Percent urban cover

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**Step 3: Select Resource Variable(s)**

Available Resource Variables

- Average Forest Patch Size
- Density of 303D streams
- Forest Patch Density
- Forest Patches with Neighbors
- Largest Forest Patch
- Number of Amphibians
- Number of Birds

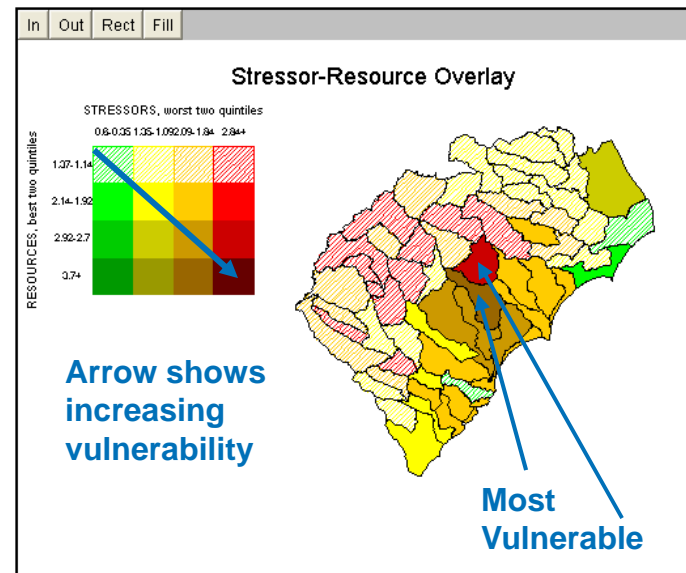
Selected Resource Variables

- Forest Patch Density
- Number of Birds
- Number of Mammals
- Number of Fish

**Step 4: Create Graph**

Static Map | Dynamic Map | Save Profile

## Custom Stressor-Resource Overlays



## Graphing Data

Useful for exploratory analysis

### Make selections to create the desired plot.

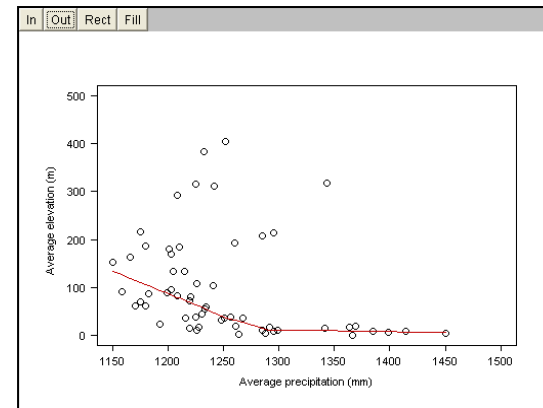
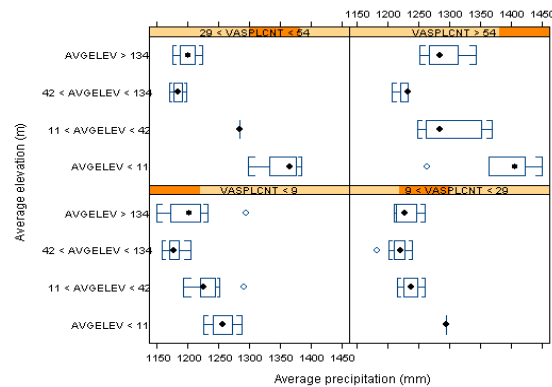
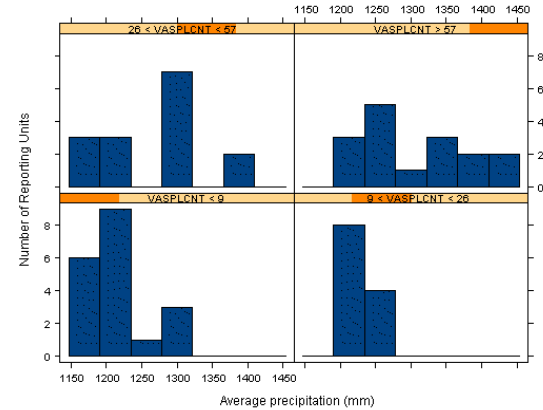
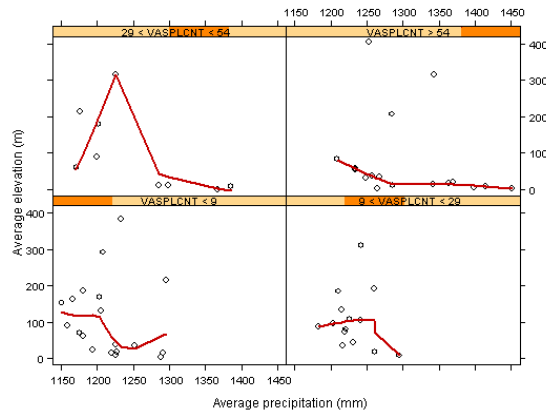
Choose Plot Type:  Scatter Plot  Histogram  Box Plot  Graphlet Scatter

Step 1: Choose X-Axis Variable:

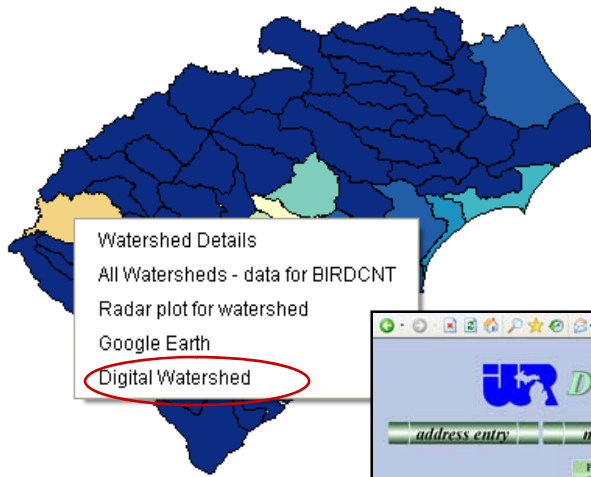
Step 2: Choose Y-Axis Variable:

Step 3: Choose Conditioning Variable:

Step 4:



## Interoperability: *Digital Watershed* – access to spatial data, finer-scale management software



**Digital Watershed**

address entry   map entry   search entry   site info

Please Type in Your Address:  
 Street Address: \_\_\_\_\_  
 City: \_\_\_\_\_  
 State: \_\_\_\_\_  
 Zip Code: \_\_\_\_\_  
 Get Map   Clear

**Map Information**  
 Zoom Factor: 2  
 Key Map  
 Exhibits the location of the view within a watershed.

**Legend**

- Watershed Boundary
- StreetMap USA
  - Airport
  - Highway
  - Primary road
  - Secondary and connec
  - Water body
  - Park
  - State
- River

**GIS Tools**   **GET UPDATED MAP**

Active Layer	Data Layer
<input type="checkbox"/>	<input checked="" type="checkbox"/> Photo from TerraServer
<input type="checkbox"/>	<input checked="" type="checkbox"/> Streets
<input type="checkbox"/>	<input type="checkbox"/> Best Management Practices
<input type="checkbox"/>	<input type="checkbox"/> Permitt Compliance System
<input type="checkbox"/>	<input type="checkbox"/> Industrial Facilities Discharge Sites
<input type="checkbox"/>	<input type="checkbox"/> Tonic Release Inventory
<input type="checkbox"/>	<input type="checkbox"/> Water Quality Stations
<input type="checkbox"/>	<input type="checkbox"/> Bacteria Stations
<input type="checkbox"/>	<input type="checkbox"/> National Sediment Inventory Stations
<input type="checkbox"/>	<input type="checkbox"/> USGS Gage Stations
<input type="checkbox"/>	<input type="checkbox"/> Water Quality Observation Stations
<input type="checkbox"/>	<input type="checkbox"/> WDM Weather Data Stations
<input type="checkbox"/>	<input checked="" type="checkbox"/> River

Scale 1 : 1.07473e+006

## Regional Growth Decision Tool

*Sustainable Environment for Quality of Life (SEQL) study: 15-county area surrounding Charlotte, NC. Two alternative futures projected to 2030*

[About the RGDT](#) | 
 [How can I use the RGDT?](#) | 
 [Use the RGDT](#) | 
 [What is SEQL?](#) | 
 [What is ReVA?](#)  
[Home Page](#) > [Levels of Detail](#) > [Executive Summary](#) > SEQL Overview Map

### View Scenario Maps

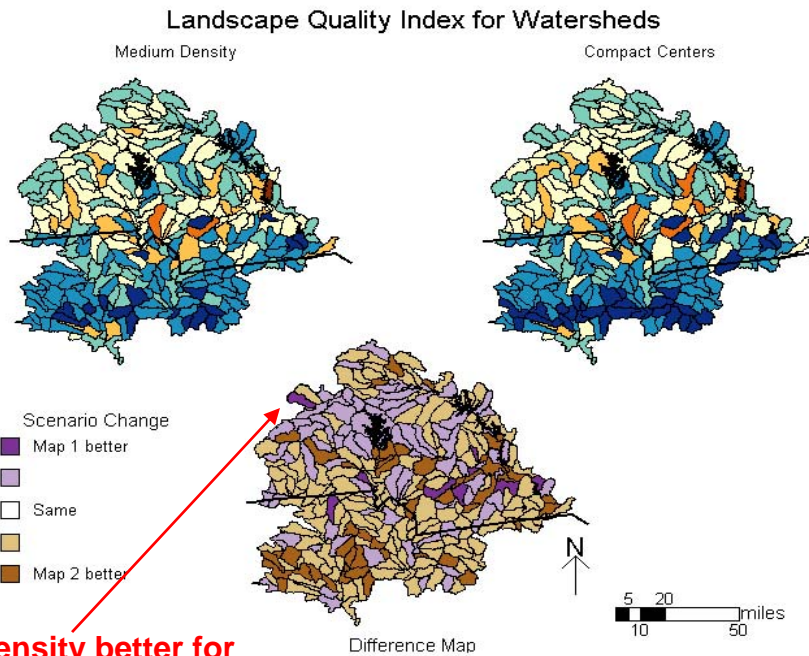
Select Layers to Display:

- County Lines
- Cities
- State Boundary
- Interstate Roads

### Landscape Quality Index for Watersheds

#### Variables

- Percent any agricultural land
- Total agriculture land on steep slopes (9% slope)
- Percent barren landcover - natural
- Percent forest landcover
- Percent natural grass land cover
- Percentage of land that is edge forest class
- Road density
- Crop land cover along streams - 60 meters
- Forest land cover along streams - 60 meters
- Natural grass land cover along streams - 60 meters
- Percent shrub land cover
- Stream density
- Percent urban landcover
- Percent wetlands land cover



**Trade-offs: Medium Density better for individual watershed; Compact Centers better for region**

[Print File](#)

If you would like more detailed data, please go to the [Management Summary page](#).



## Advantages of CC-EDT

- **Available now!**
- **Web tool provides universal access**
- **Powerful statistical engine integrates data “on the fly”**
- **Visualization allows data drilldown and assessment of spatial relationships**
- **User-defined weighting allows valuation for ecosystem services**
- **Integration can be done for any combination of variables**
- **New spatial integration methods adjust for correlations among variables**
- **Useful for researchers and decision makers**

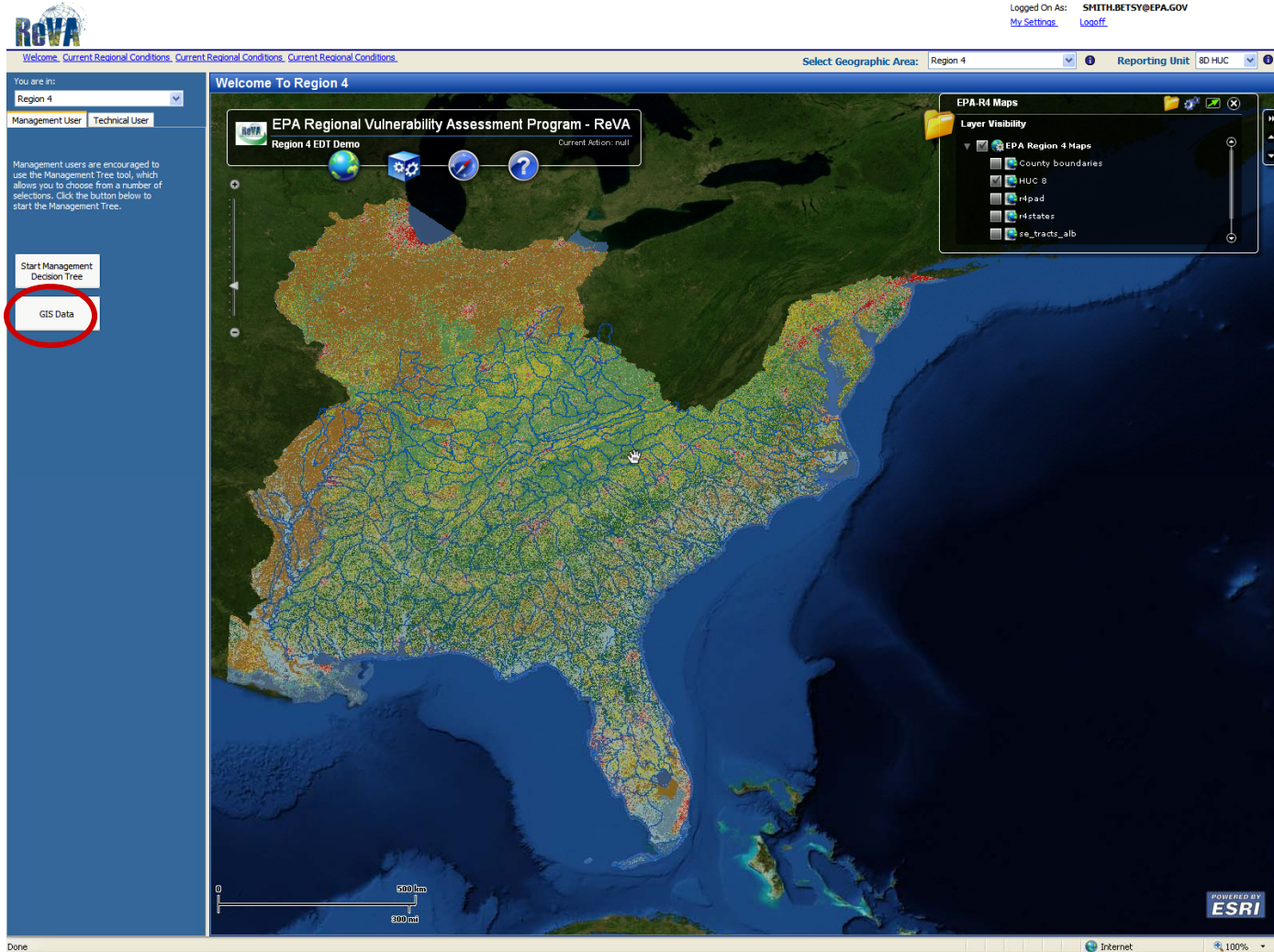
# Coming Improvements

- Improved usability to address needs\*
- *Mash-up* of EDT with ArcServe version for finer-scale analyses\*\*
- Reorganization to reflect supply and demand (value) of ecosystem service metrics (ongoing interim products)
- Ability to change directionality of variables for integration (e.g. threatened and endangered species)
- Additional options for break points for mapped value ranges
- Additional data layers for Coastal Carolinas
- Finer scale geography (12D HUC's)
- Incorporation of future scenarios, trade off analysis
- New data categories (economic)
- Spatial analysis capabilities

# **\*Top-level Management Questions**

- **Assess existing regional condition and policy performance**
- **Create a Regional Ecosystem Health Scorecard**
- **Prioritize for Conservation**
- **Prioritize for Recovery Potential**
- **Identify regional Vulnerabilities**
- **Evaluate Current Ecosystem Services**
- **Evaluate trends through 2020**
- **Evaluate Opportunities for Action**

## \*\*Mash-up of SPlus EDT with ArcServe



The screenshot displays the ReVA (EPA Regional Vulnerability Assessment Program) web application interface. The main map area shows a geographic view of Region 4, overlaid with various data layers including county boundaries, HUC 8, r4pad, r4states, and re\_tracts\_alb. The interface includes a sidebar on the left with a 'Start Management Decision Tree' button and a 'GIS Data' button circled in red. The top navigation bar shows the user is logged in as SMITH.BETSY@EPA.GOV. The bottom of the screen features a scale bar (0 to 800 miles) and the ESRI logo.

**Thanks for your time!**

**Any Questions / Feedback**

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**<http://www.waratah.com/coastalcarolinas>**