

# Regional Vulnerability Assessment - ReVA

## Emerging Technologies

U.S. Environmental Protection Agency  
Office of Research and Development,  
National Exposure Research Laboratory,  
Environmental Sciences Division, Research Triangle Park, No. Ca.

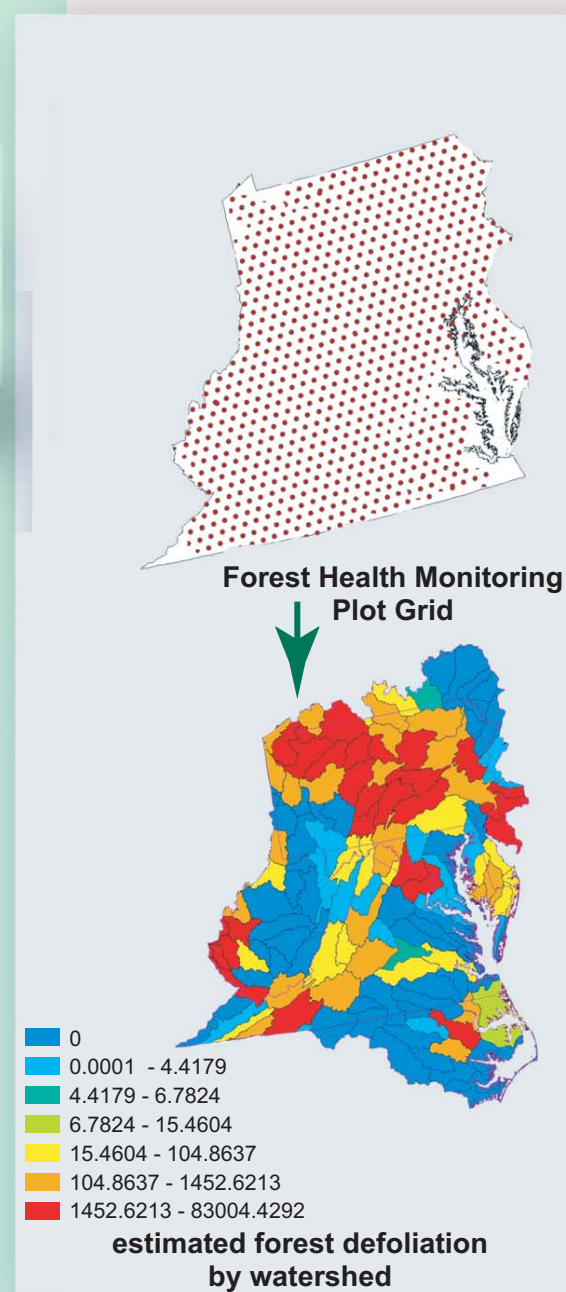
### ReVA is ...

- Synthesizing monitoring data and model results to target risk management activities
- Developing a flexible integration framework that can be used in any region, with any data, at any scale
- Estimating condition and exposure for every point on the map
- Ranking relative vulnerabilities, current and future
- Enabling trade-off analyses through "what if" scenarios
- Informing diagnosis of causality
- Linking environmental health with fiscal and human health
- Working directly with clients

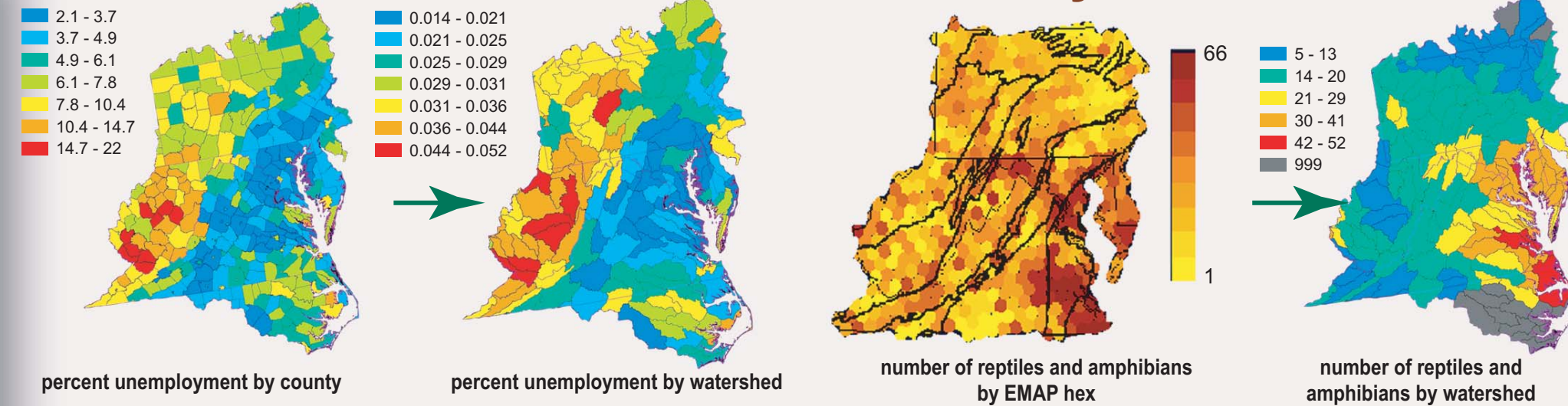
[www.epa.gov/rev](http://www.epa.gov/rev)

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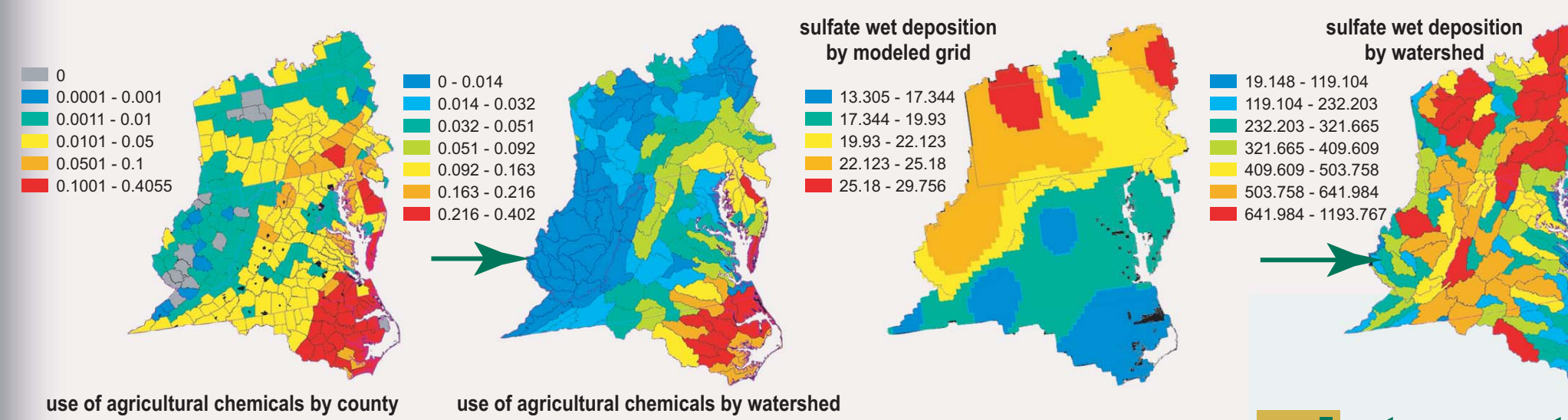
### Assemble/Acquire Data



### On Resource Sensitivity



### On Stressor Distributions



### Integrate Information and Communicate Current Vulnerabilities

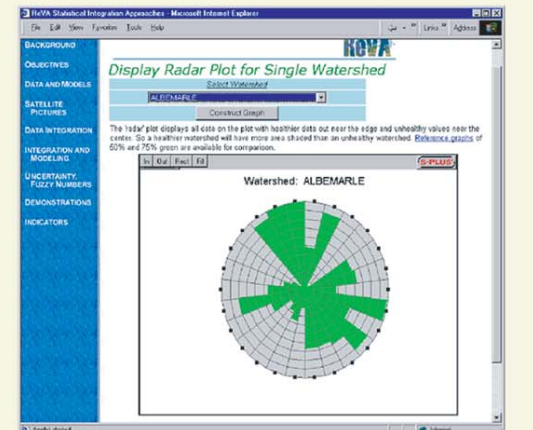
#### Integration Methods

- Spatial overlap
- Quintiles
- Multivariate methods
- Shift in state space
- Weighted average
- Matrix methods
- Visualization methods
- Decision theoretic methods
- Combination of multiple methods

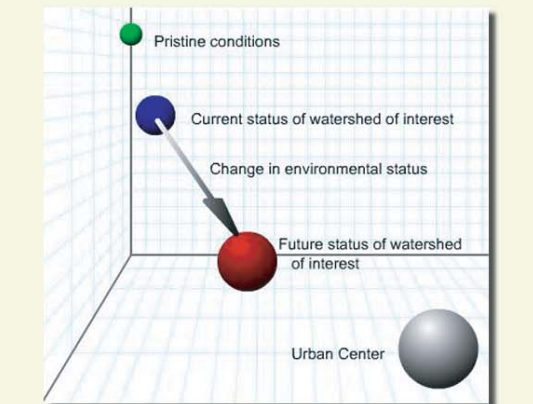
#### Vulnerability Indices

- Rank 1 (Cluster 4)
- Rank 2 (Cluster 9)
- Rank 3 (Cluster 8)
- Rank 4 (Cluster 7)
- Rank 5 (Cluster 2)
- Rank 6 (Cluster 1)
- Rank 7 (Cluster 5)
- Rank 8 (Cluster 6)
- Rank 9 (Cluster 3)
- Not included

#### Radar Plots



#### Shift in State Space



#### Quintiles

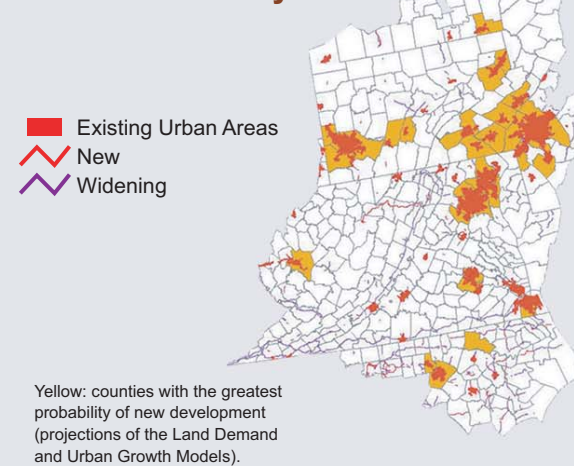
### Develop Future Scenarios

#### Land Use Change

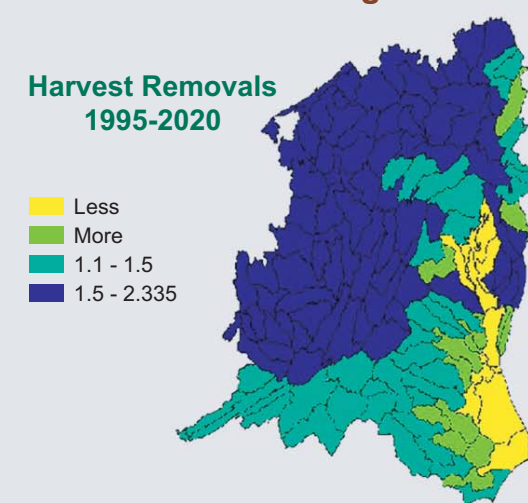
Projected population growth along with associated changes in land use and pollutant loadings will be used to forecast environmental impacts apt to result from alternative policy decisions.



#### Selected Projections for Development in MAIA by 2010

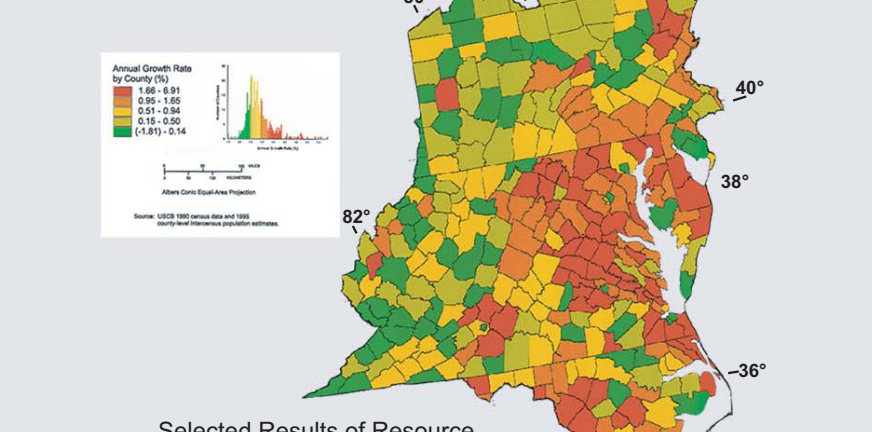


#### Projected Hardwood removals through 2020

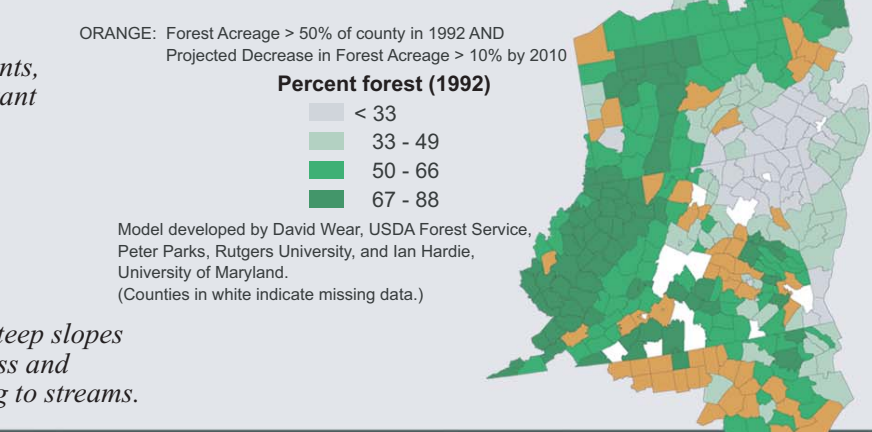


ReVA is working directly with clients to develop a suite of future scenarios that depict the environmental implications of different management alternatives.

#### Annual Population Growth Rate Mid-Atlantic Study Area 1990-1995



#### Selected Results of Resource Economics Model to 2010



Forested riparian zones filter sediments and pollutants, especially in agricultural areas, and provide important wildlife habitats.



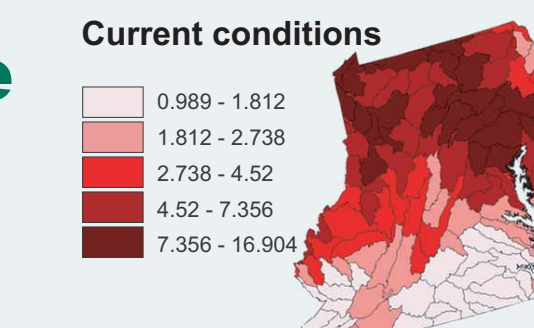
Agriculture on steep slopes increases soil loss and sediment loading to streams.

### Integrate Information and Communicate Future Vulnerabilities

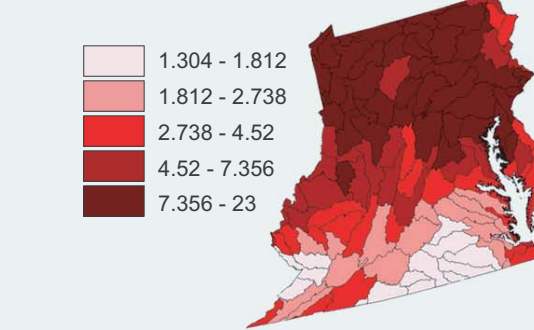
#### Input into Decisions Affecting ...

- Nonpoint-source pollution in water
- Increased sediment/nutrient loadings
- Acid mine drainage
- Allocation of TMDLs
- Drinking water quality and supply
- Increased risk of flooding
- Urban sprawl/quality of life
- Fiscal health
- Economic opportunities
- Future risks to human health
- Conservation of native biodiversity
- Pests and pathogens in forests
- Fragmentation of forests
- Forest health and productivity
- Cumulative impacts of multiple stressors
- Restoration priorities

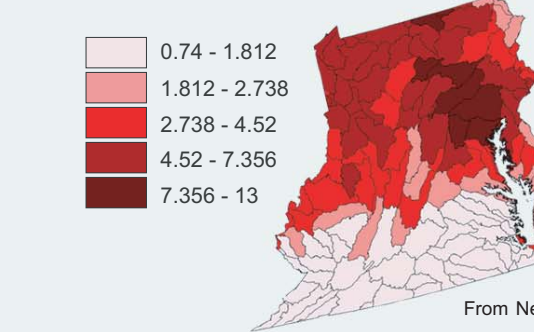
### Future Scenarios of Nitrogen Loadings Based on Landscape



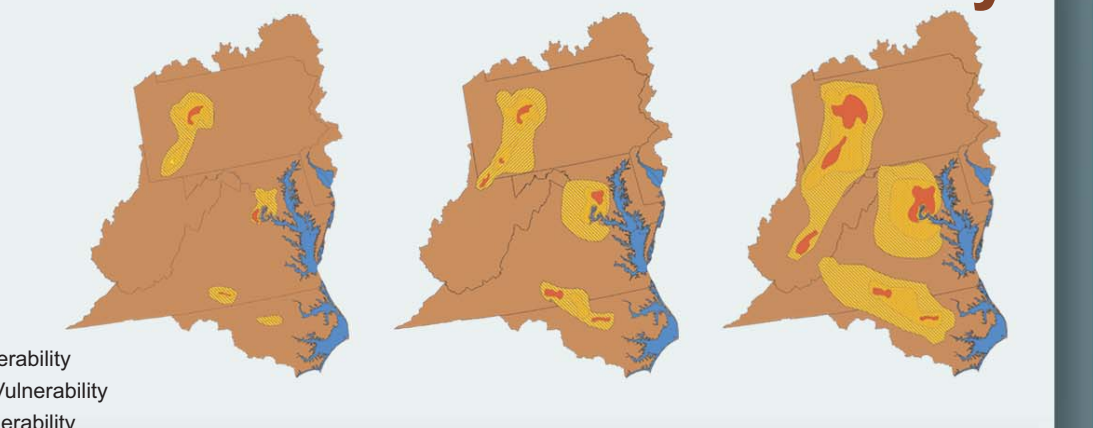
#### 10% decrease in riparian forest



#### 10% increase in riparian forest



### Alternative Scenarios of Environmental Vulnerability



#### Expected Products

- Decision-support tools that improve prioritization of environmental issues, risk reduction strategies, and development of future policies using
  - GIS, remote sensing, and predictive modeling to forecast changes in ecosystem resiliency
  - New indicators to measure cumulative effects and ecosystem vulnerability
  - Communication methods that illustrate the social and economic trade-offs associated with alternative decisions
- Identification of information and research gaps that limit further improvements to environmental decision-making

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