

# Impacts of Climate Change on Mid-Atlantic Species-at-Risk

*Rachel Muir, USGS  
Tom Smith, VA  
Natural Heritage Program*

*Adapting to Climate  
Climate in the  
Mid-Atlantic  
March 24, 2010*

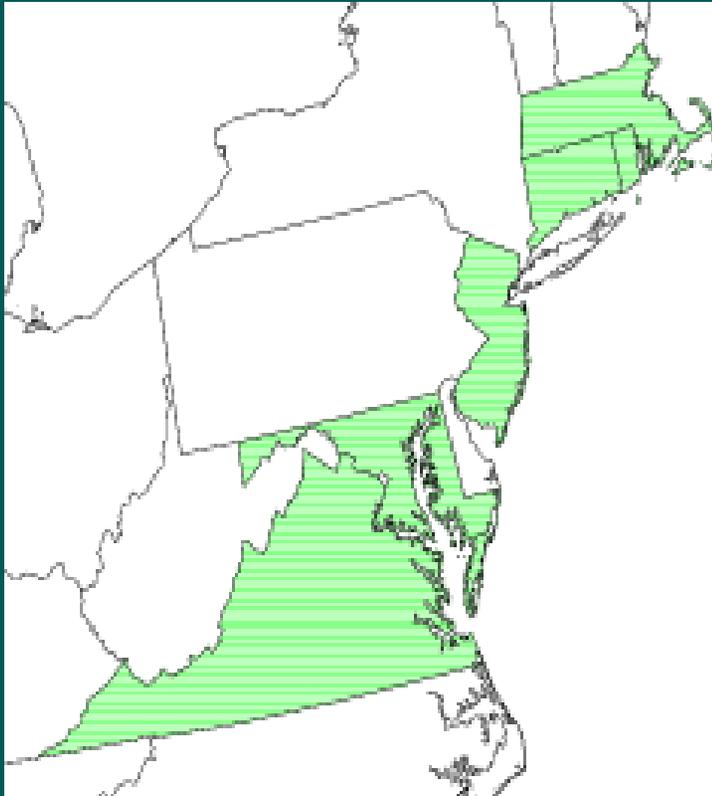


Northeastern tiger beetle --*Cicincela dorsalis*

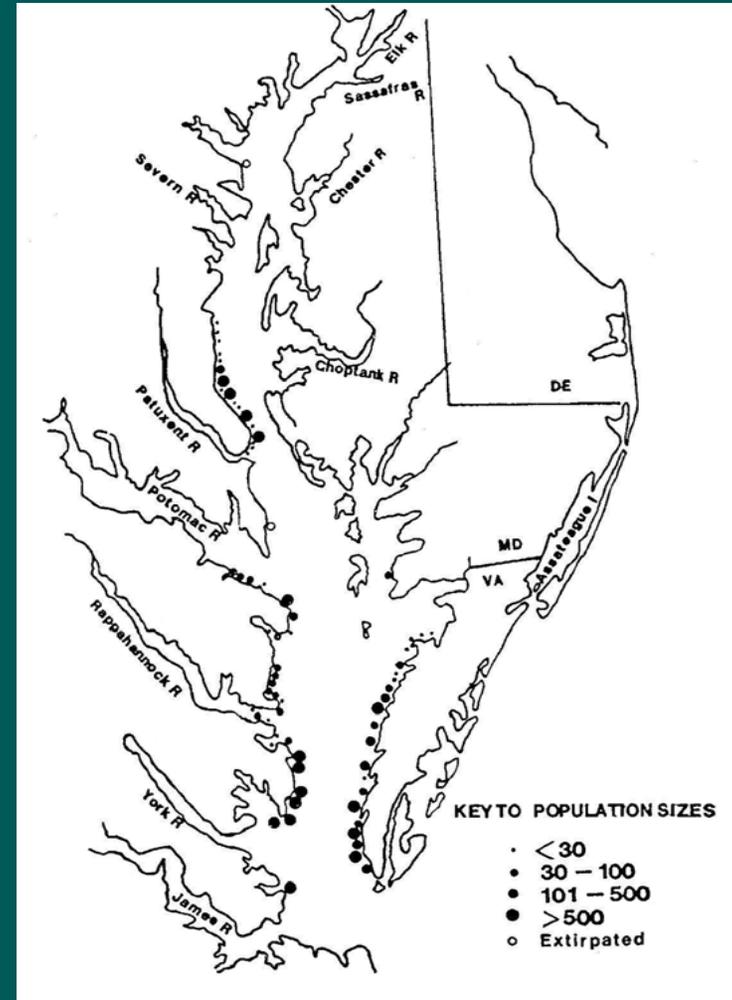
# Northeastern Beach tiger beetle (threatened status under ESA) -- Beach habitat



# Northeastern tiger beetle – Distribution by state and in the Chesapeake Bay

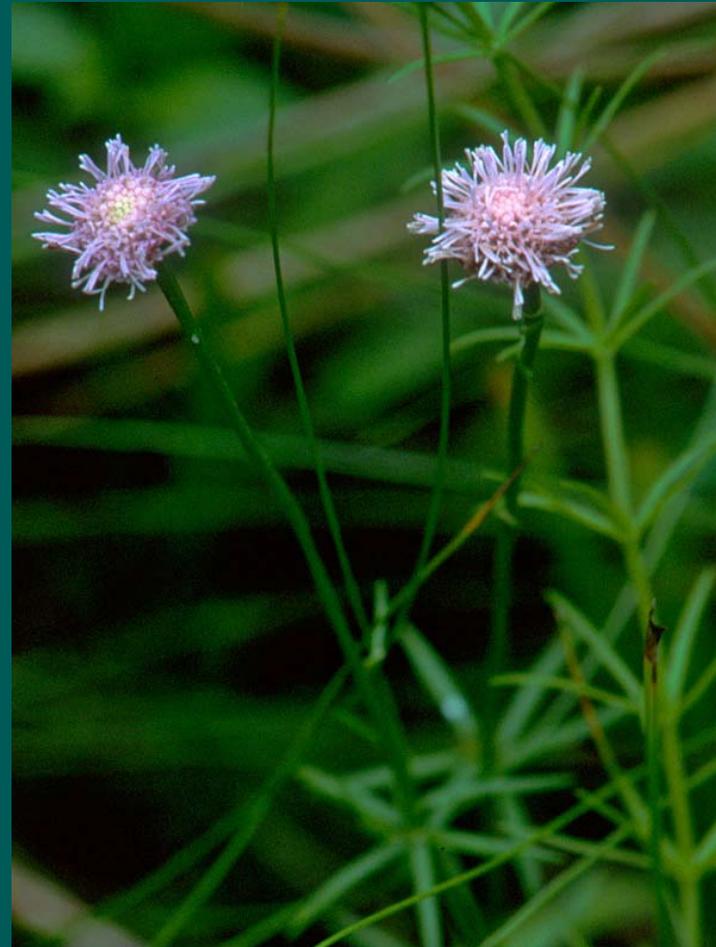


State Distribution



# Objectives (1)

- A. Broadly characterize the diversity and the imperiled species and habitats of the Mid-Atlantic;
- B. Briefly characterize what we need to know about climate change trends to protect imperiled species



Pink Bog Button, *Scleropepis uniflora*

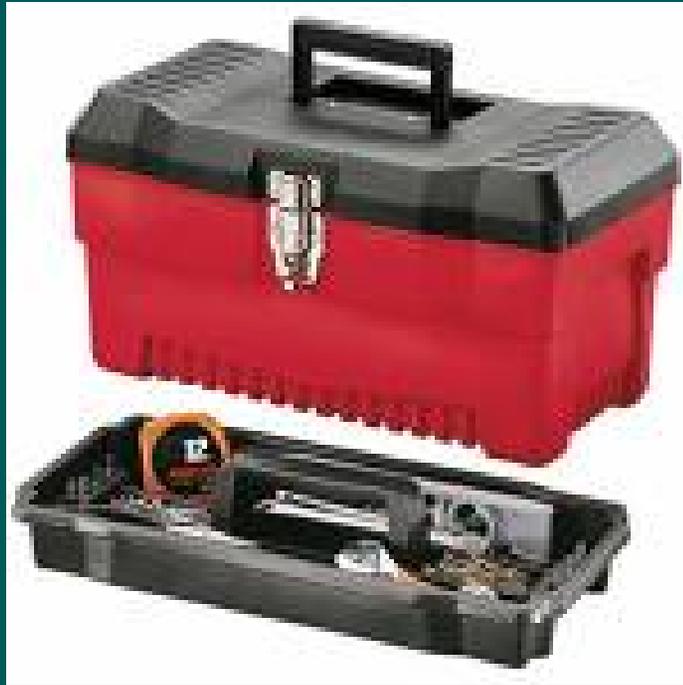
# Objectives (2)

- C. Identify the existing threats in addition to climate change that have placed them at risk;
- D. Suggest ideas and priorities for new actions and approaches.



Gray's Lily, *Lillium grayi*, high elevation  
Southern Appalachian endemic

# Preliminary Conclusion (for discussion and debate --)



- Existing tools in the Conservation Tool Box – used well and fully supported – will protect most imperiled species;
- However, where climate change factors are the chief threat of extinction we are in new territory.

# A. Anticipated Climate Change for the Mid-Atlantic Region

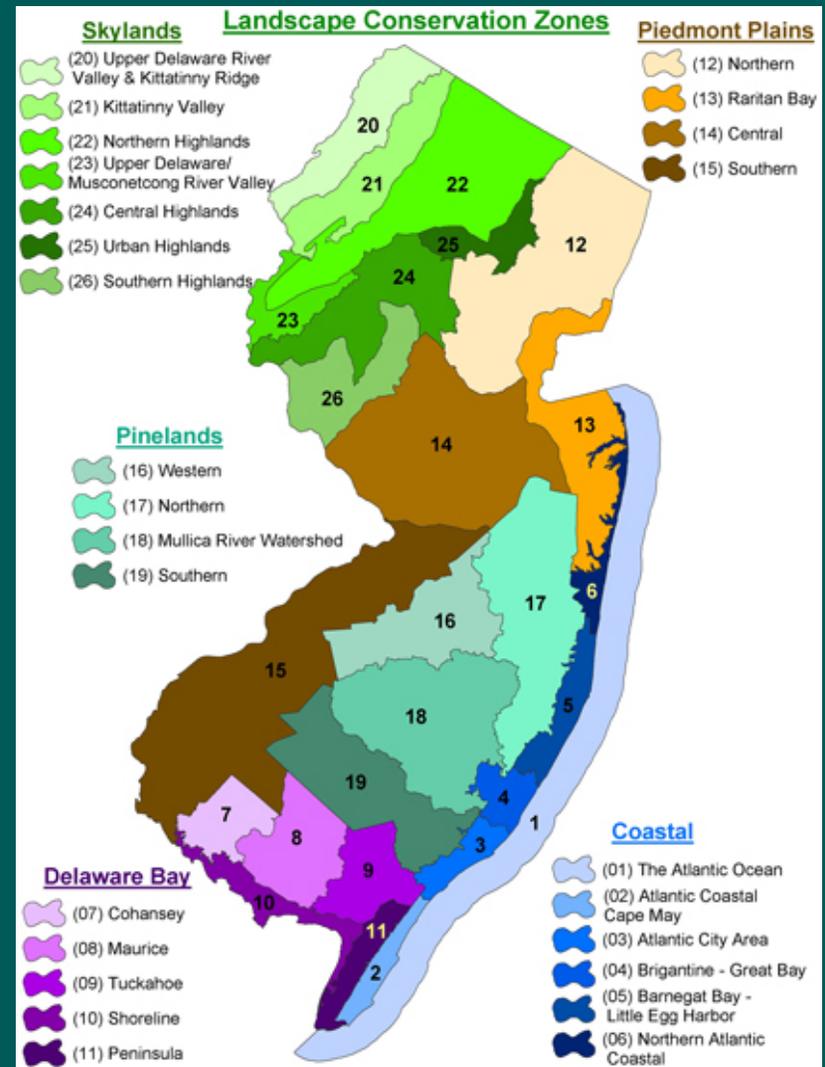
- Warmer summers
- Wetter winters
- More intense storms

However, for imperiled species the specific habitat needs and tolerances are often unknown

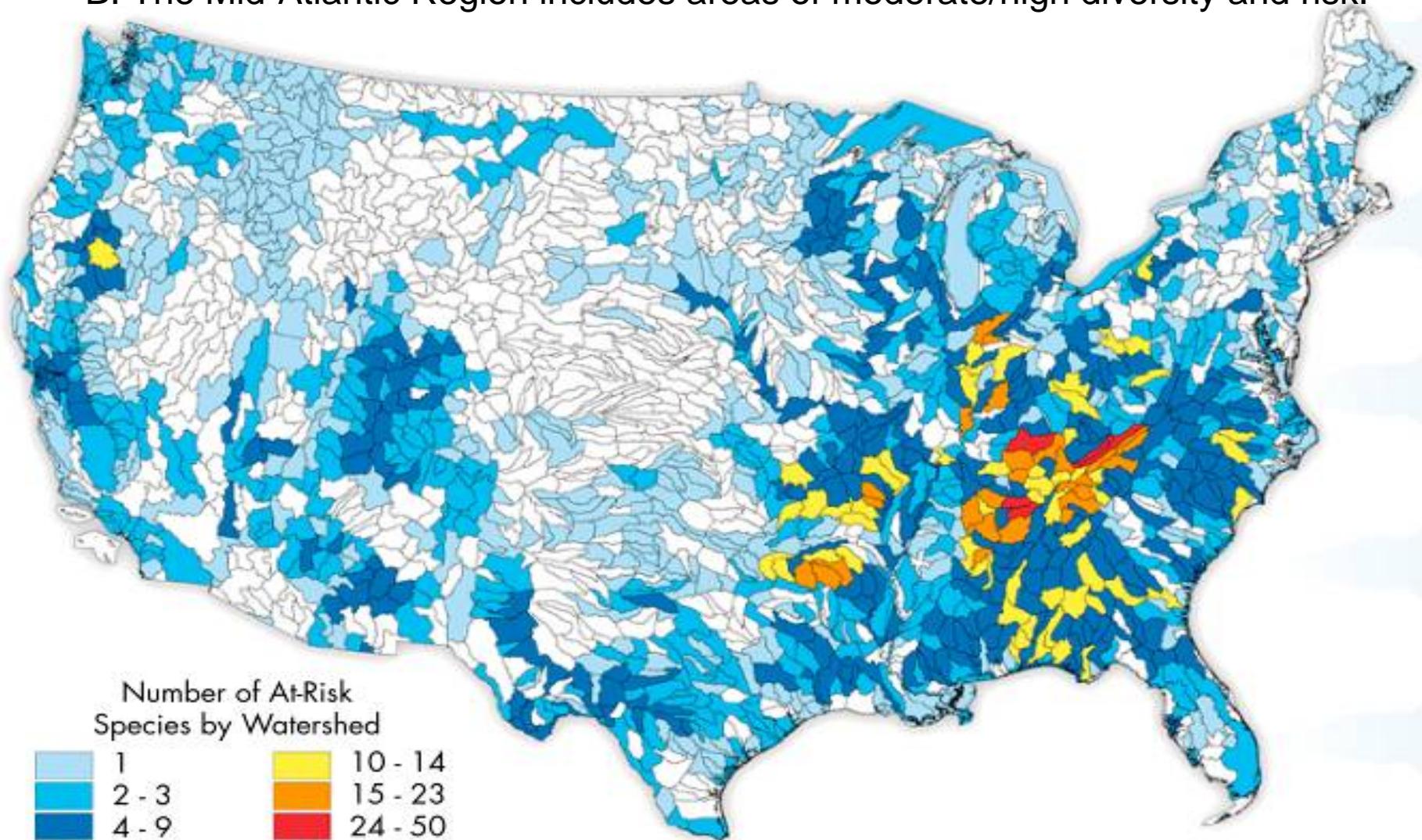


## B. Identify Imperiled Species – First Stop are State Wildlife Action Plans

- Significant ground-work has been done to list and prioritize species and habitats
- Basic research gaps exist (a Federal role)
- Regional approaches are critical to success



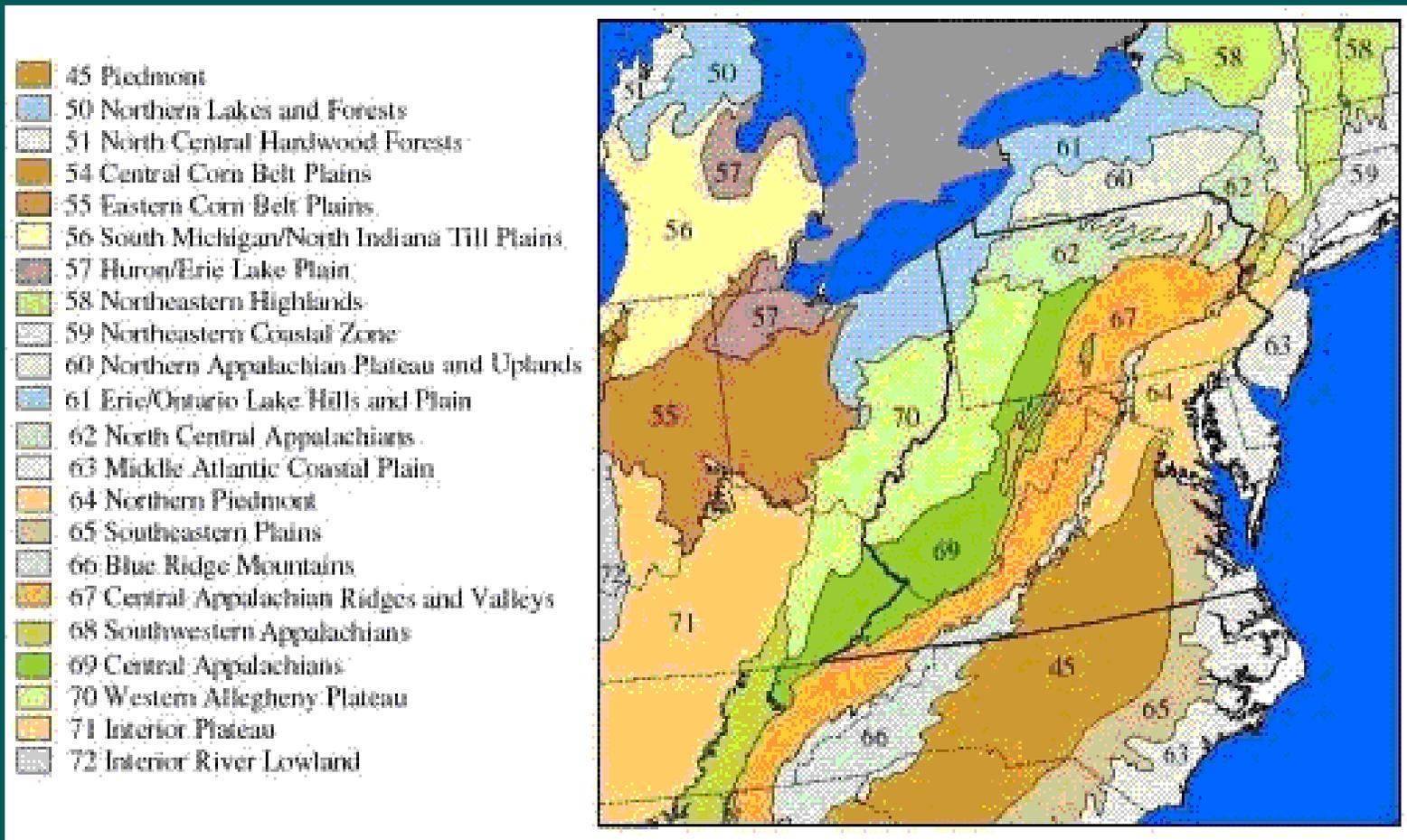
B. The Mid-Atlantic Region includes areas of moderate/high diversity and risk.



### Figure 5. Hot Spots for At-Risk Fish and Mussel Species

*Watersheds with 10 or more at-risk fish and mussel species are concentrated in the Southeast, reflecting the extraordinary species diversity of rivers and streams in this region. From Stein et al, 2000*

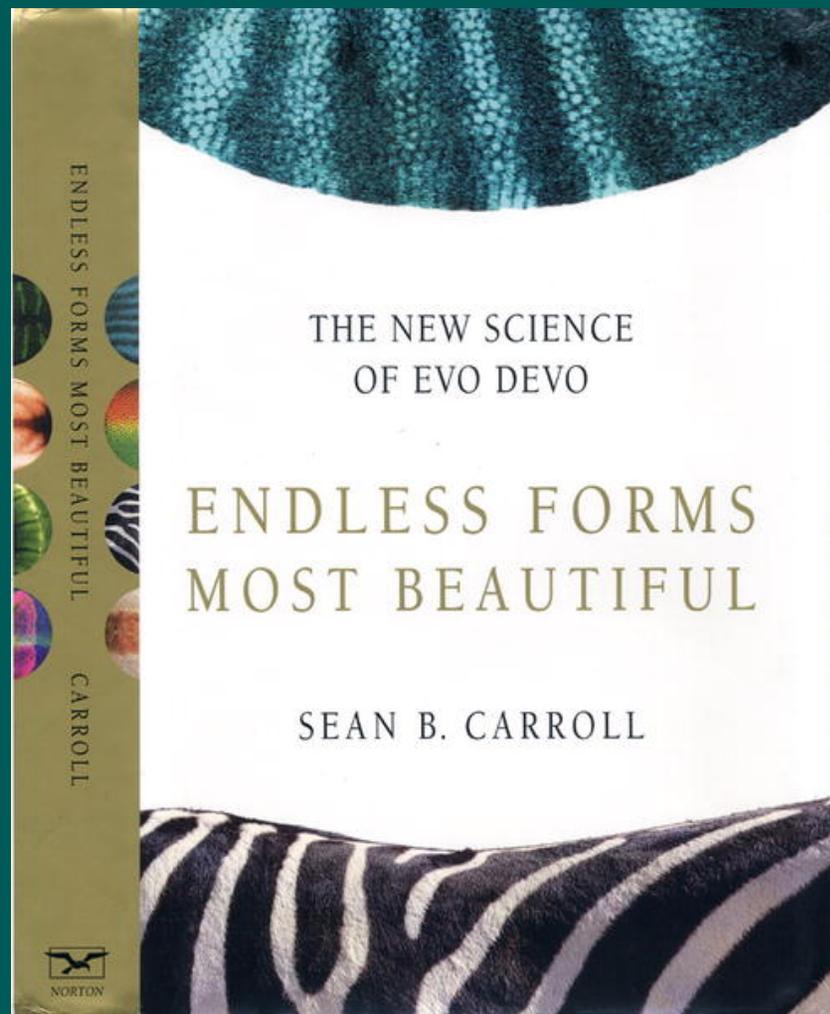
## B. Diverse Landscape at a Coarse Scale – Fine Scale Reveals Even Greater Diversity



B. The diverse landforms and ecological history of our region are a wellspring of evolution and diversity

“...whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.”

— Charles Darwin

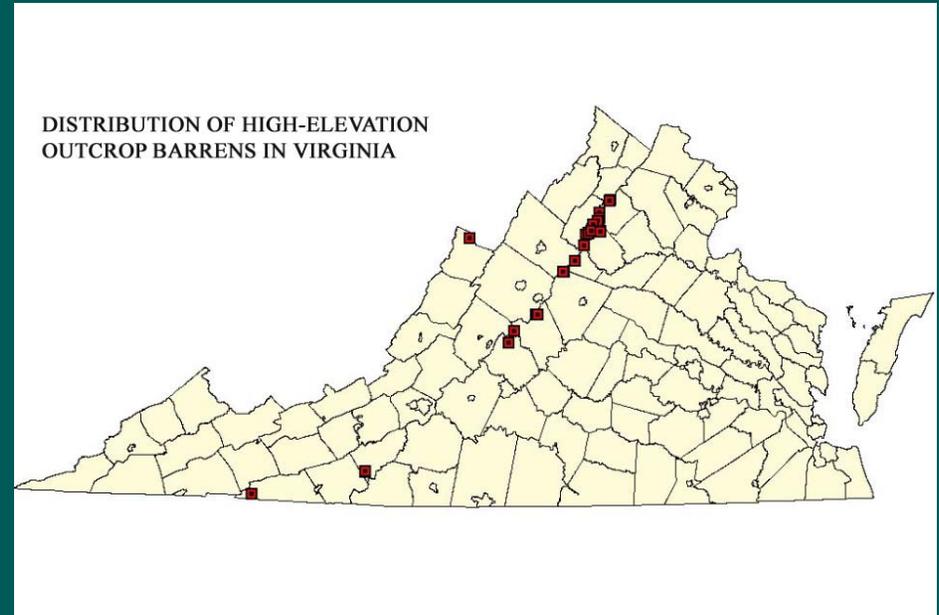


# Mid-Atlantic biodiversity

- **High endemism** due to:
- Altitudinal gradients and barriers
- Relative long-term ecological stability
- Species radiation through isolation over geological time



## B. Diverse Montane Habitats that are also at Risk –



- High Elevation Outcrop Barrens support many disjunctive boreal alpine plant species. Climate sensitive both due to temperature and precipitation changes.

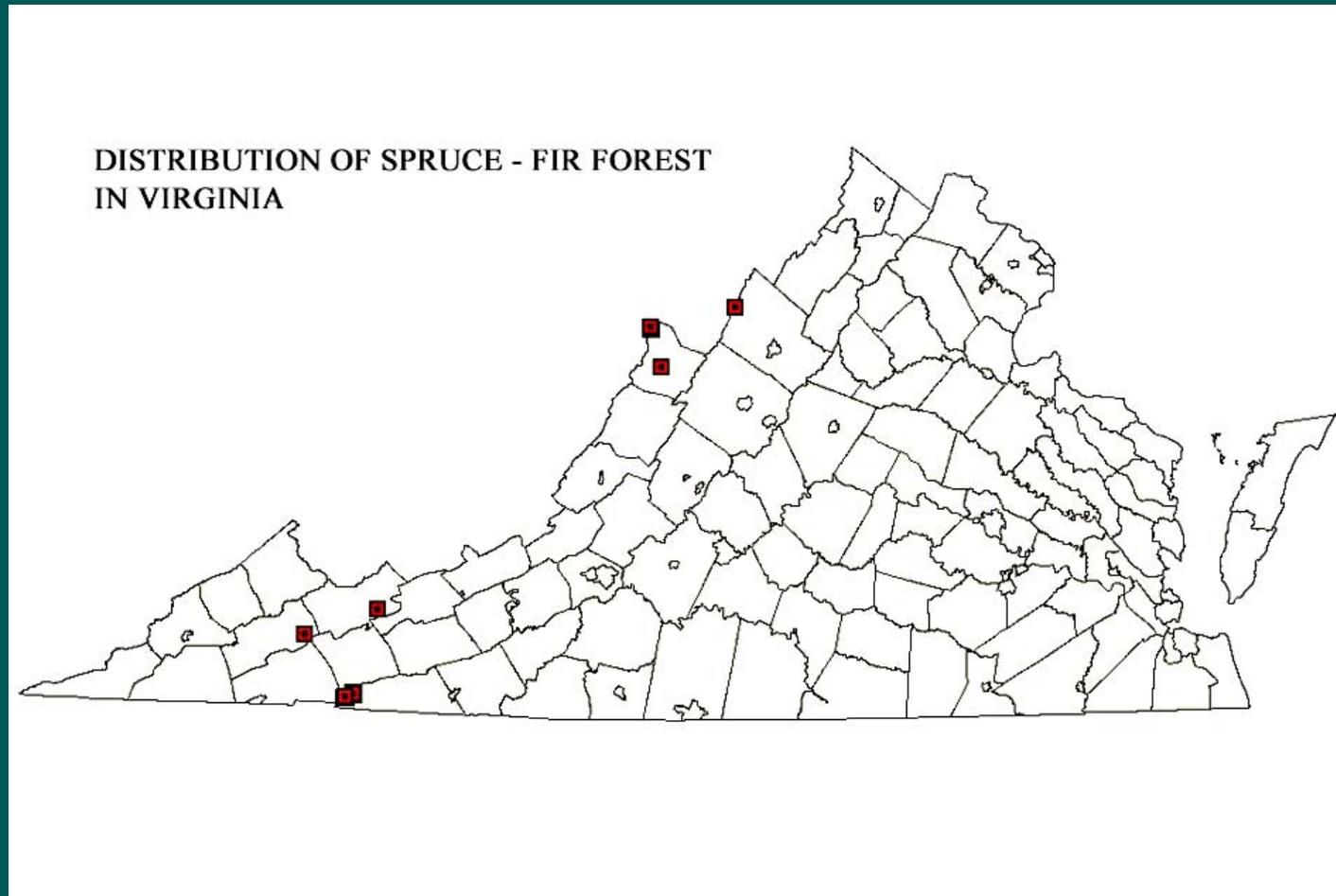
## B. Habitats at Risk (continued)

- Montane Communities  
Such as spruce-fir forests are at risk from changes in temperature and precipitation



# Distribution of Spruce-Fir Forest in Virginia

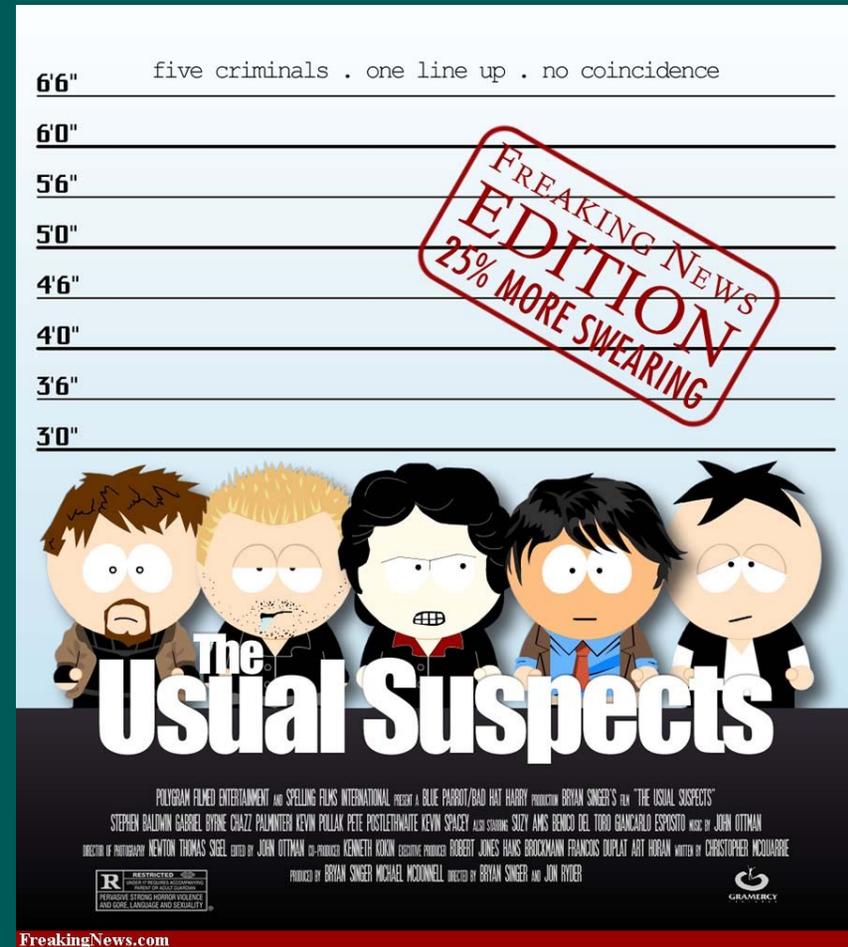
*(Virginia Heritage Program, 2009)*



# C. Imperiled Species are Resources Already at Risk From Existing Threats

Threats include the “Usual Suspects”:

- Habitat Loss
- Invasive Species
- Pollution
- Contaminants
- Disease



## C. Habitat Loss is the Primary Source of Risk to Biodiversity

- Urbanization and sprawl
- Agricultural expansion and practices
- Expanding infrastructure
- Energy resource development
- Fragmentation



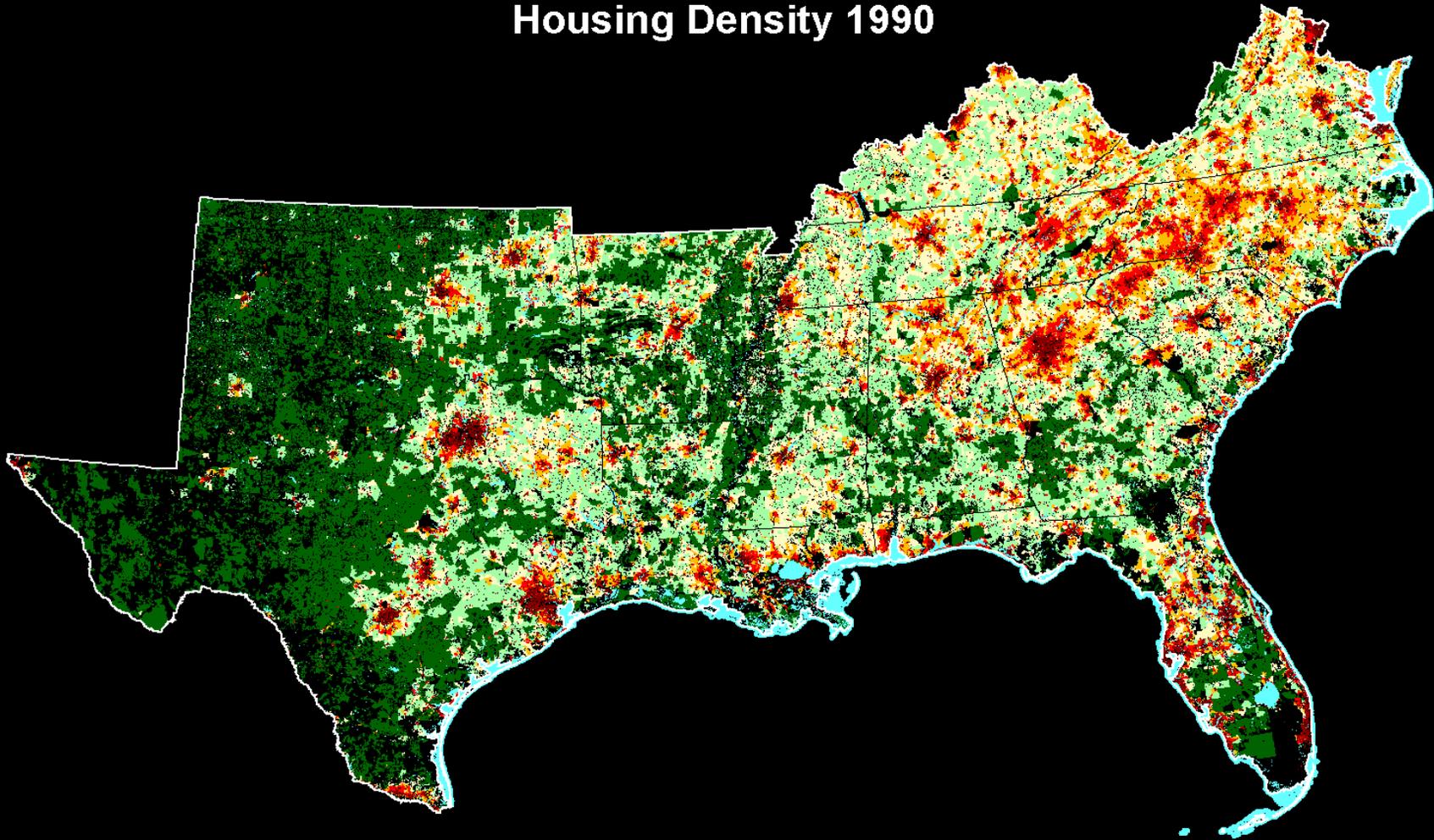
# C. Current Threats (continued)

- Housing density – land use change is a reasonable proxy for impacts on habitat
- Models change and footprints of growth sensitive to economic factors



# Southern Region

## Housing Density 1990



Housing Units per Km<sup>2</sup>



0



2 - 4



8 - 16



>128



0 - 2



4 - 8



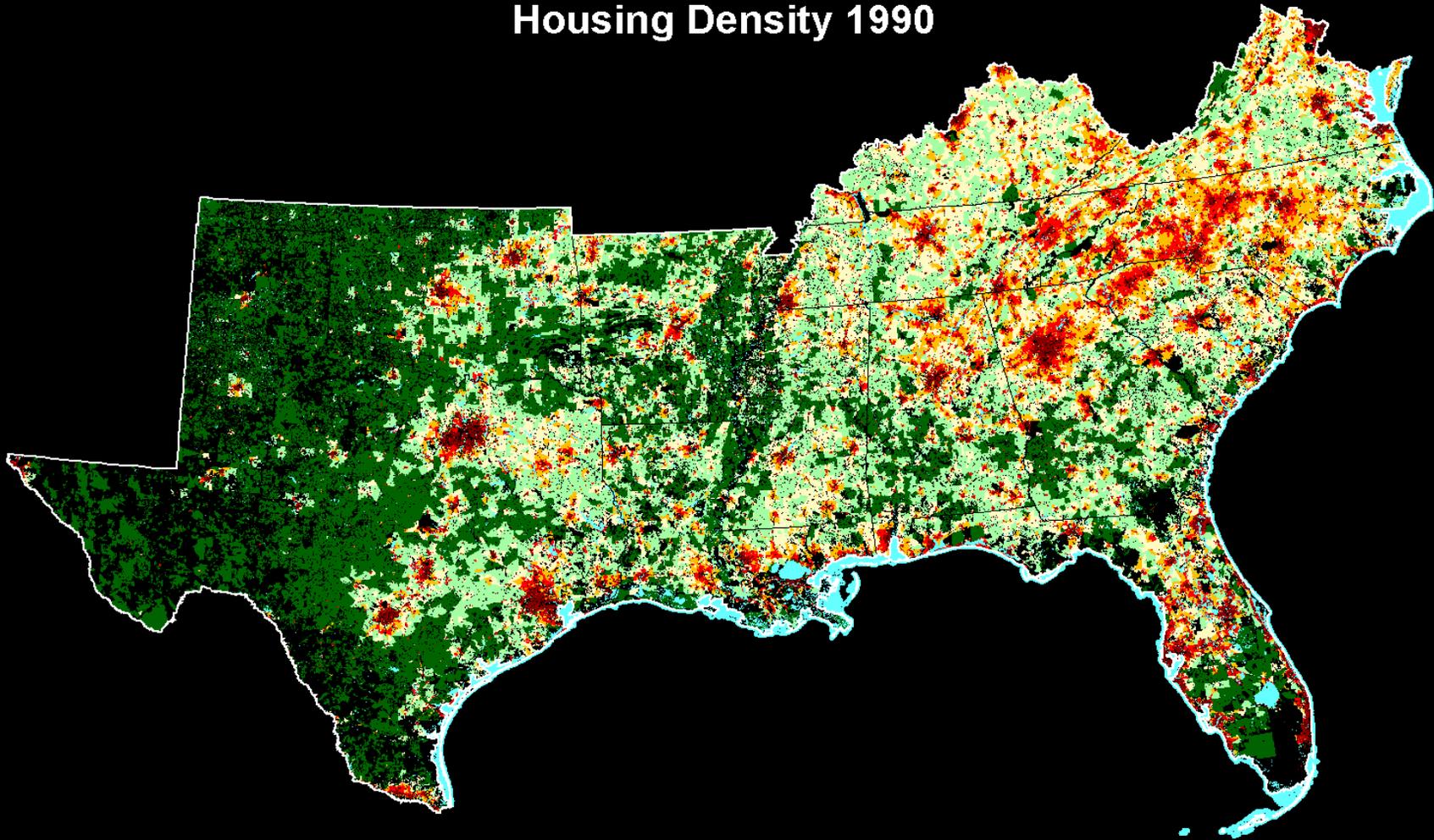
16 - 128



Water

# Southern Region

## Housing Density 1990



Housing Units per Km<sup>2</sup>



0



2 - 4



8 - 16



>128



0 - 2



4 - 8



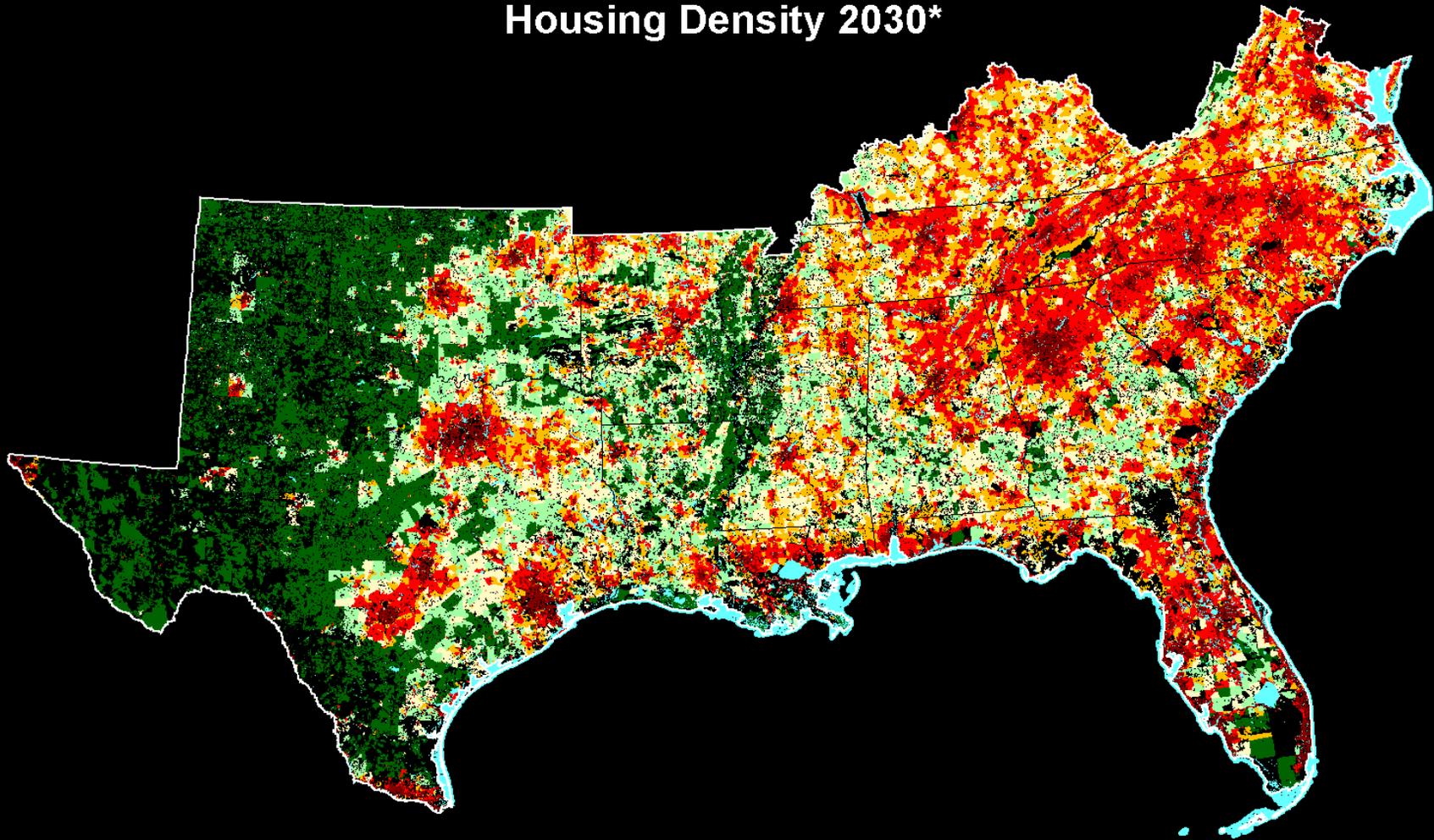
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Water

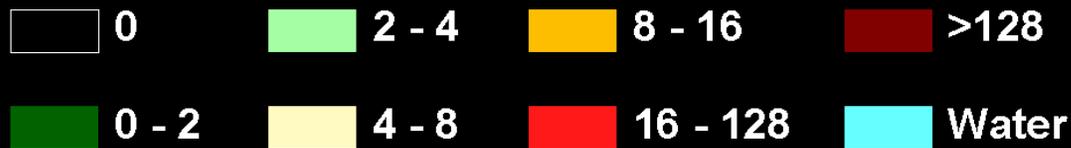
# Southern Region

## Housing Density 2030\*



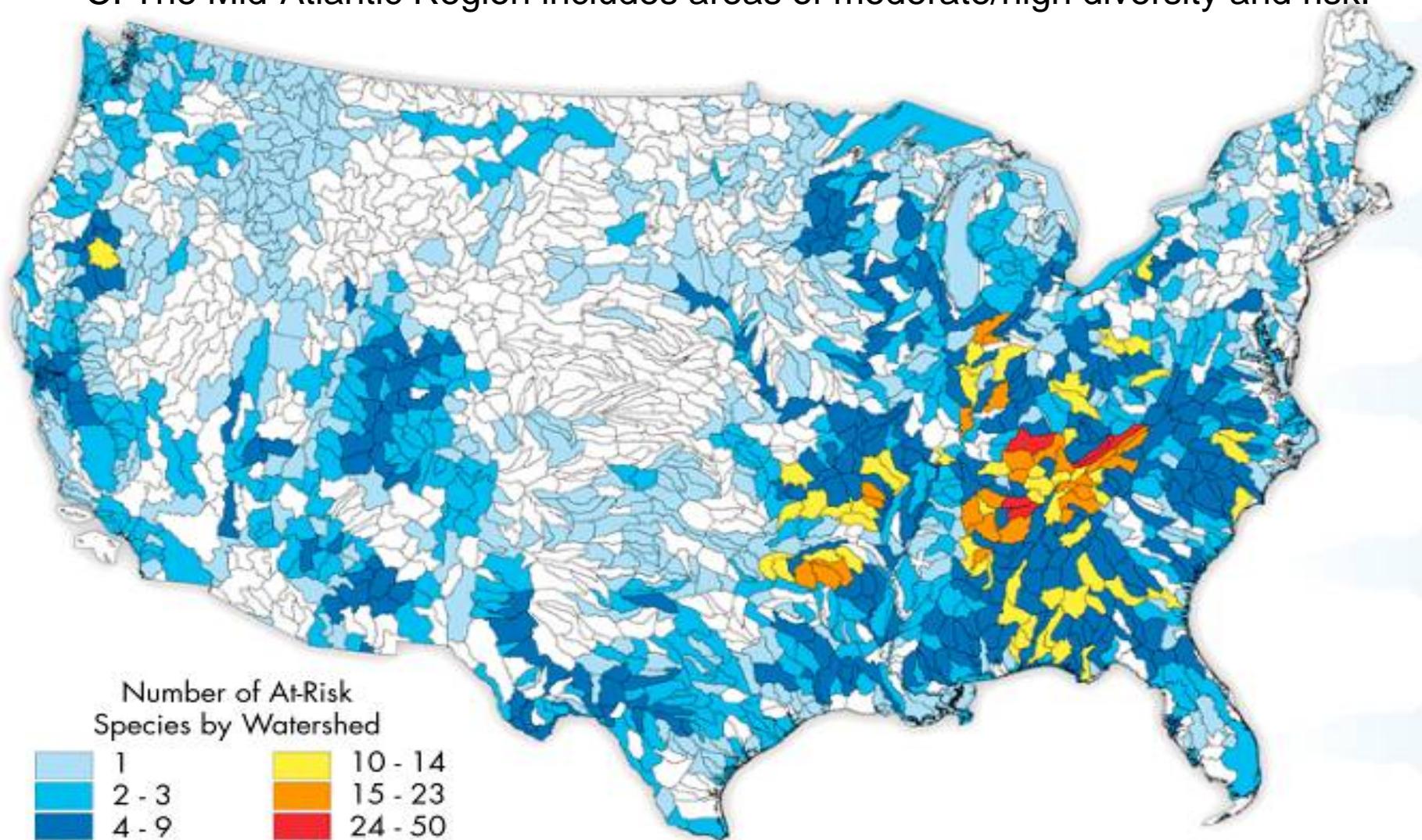
Housing Units per Km<sup>2</sup>

\*Linear projection of 1990s growth



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University of Wisconsin-Madison

C. The Mid-Atlantic Region includes areas of moderate/high diversity and risk.



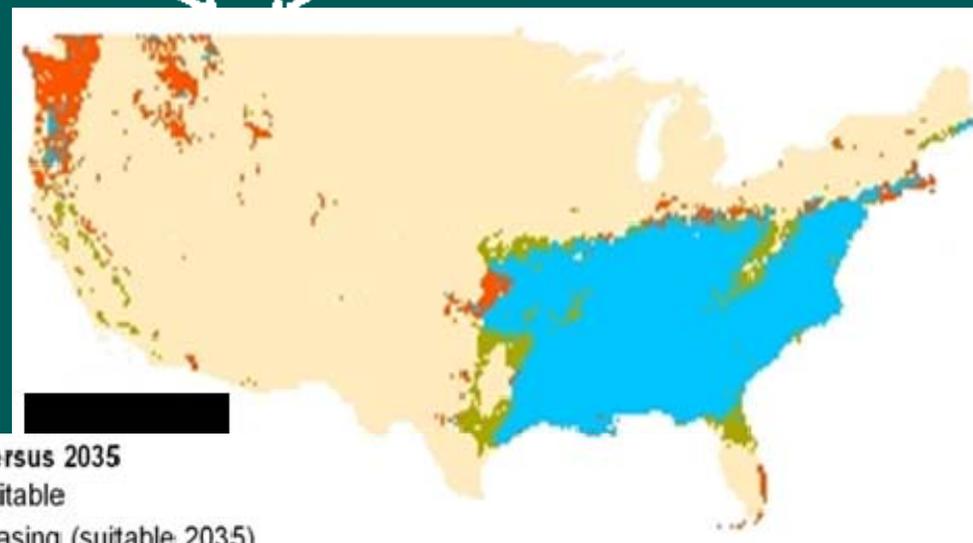
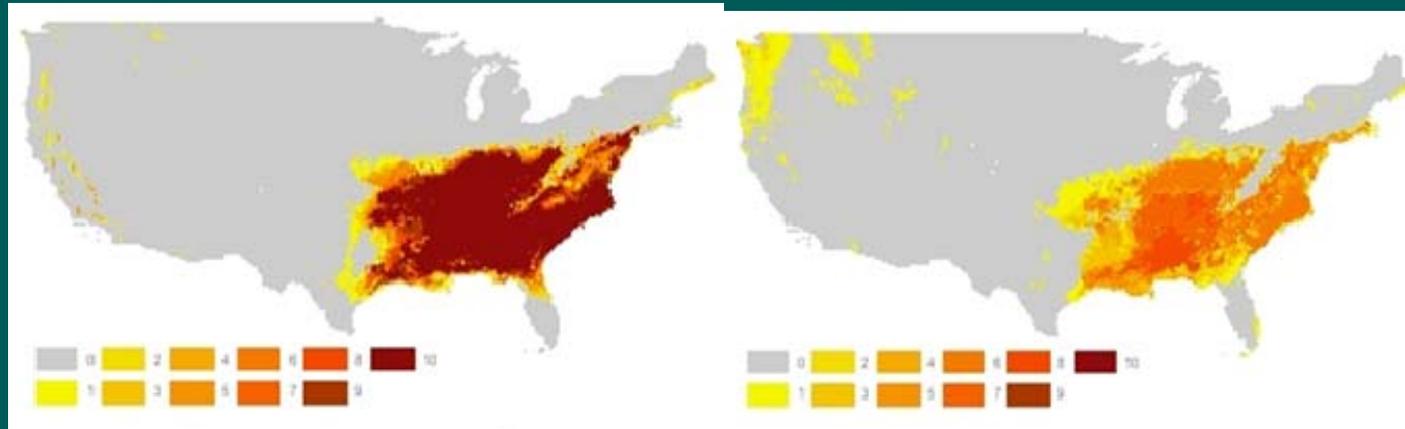
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*Watersheds with 10 or more at-risk fish and mussel species are concentrated in the Southeast, reflecting the extraordinary species diversity of rivers and streams in this region.*

*From Stein et al., 2000*

# C. Impacts of invasive species: risk analysis for northern expansion of Kudzu:

*Jarnevich and T. J. Stohlgren. 2009.*



Current versus 2035

- Unsuitable
- Increasing (suitable 2035)
- Decreasing (suitable current)
- Stable (suitable both)

## D. (Finally) Options for Protecting Imperiled Species in a Changing Climate

- Climates have always been changing – we need to
- reducing the rate of change;
- Recover and sustain healthy populations from current risks (resilience!)
- Educate and Outreach
- Effectively implement current policies and regs



Northern Flying Squirrel,  
*Glacoymas sabrius*

## D. New Approaches Necessary to Address Climate Change Risks for Imperiled Species

- ESA will not protect imperiled species from climate change
- Will not mitigate climate change through ESA
- New science, new partnerships new legislation are better equipped to address these needs.



Sam Hamilton, discussing Landscape Conservation Cooperatives, 2009

## D. New Approaches (continued)

- **Public Private Partnerships**
  - Joint Ventures
  - Fish Habitat Partnerships
  - LCCs and DOI Climate Change Centers
- **New Science**
  - Monitoring networks to inform decisions
  - Propagation, assisted migration, “cradle to grave” management of some populations

D. It's the water, stupid – aquatic resources will be the hardest hit by climate change and increasing human needs



Tan Riffleshell



Vermillion Darter



Tar River Spiny Mussel



Warrior Darter

# Not Options

- Strategic retreat on imperiled species not a option.
    - only two resources can not be reclaimed as a result of climate change:
      - cultural resources
      - species diversity
- When they are gone they are gone forever.

# Our Fear Factor – Extreme Events



Thanks! Questions?

