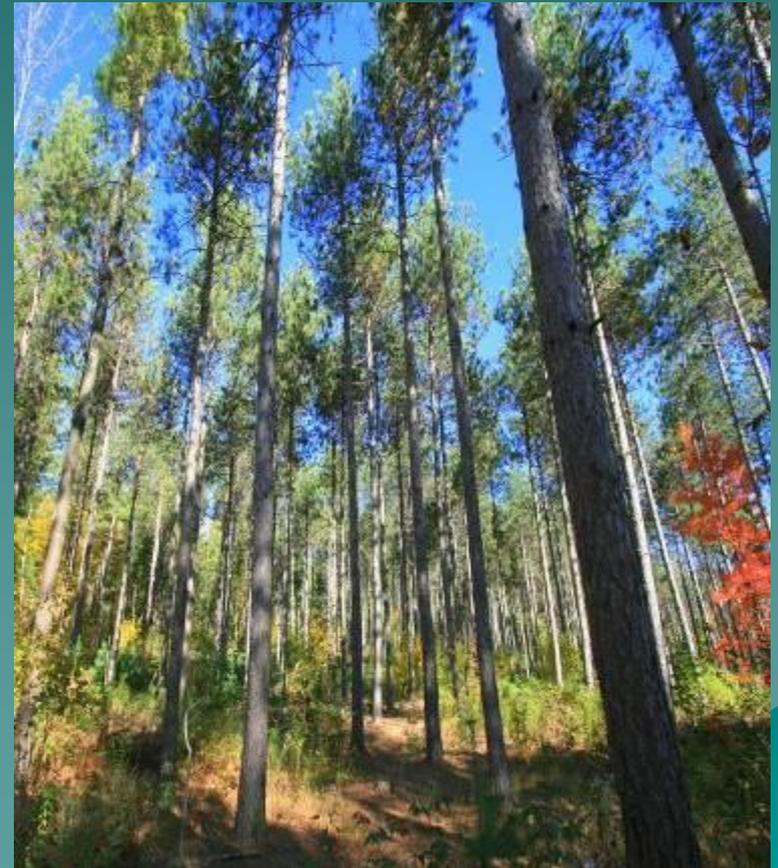


# CLIMATE CHANGE AND FUTURE CONSERVATION

Climate change raises important questions about future conservation of ecological resources:

- ◆ Vulnerability questions
- ◆ Applied conservation questions



# VULNERABILITY ASSESSMENTS

Ask questions about:

- ◆ *What* things are most vulnerable?
- ◆ *Why* they are vulnerable
  - Understanding why assists in determining possible adaptation responses



# DEVELOPMENT OF VA METHODS

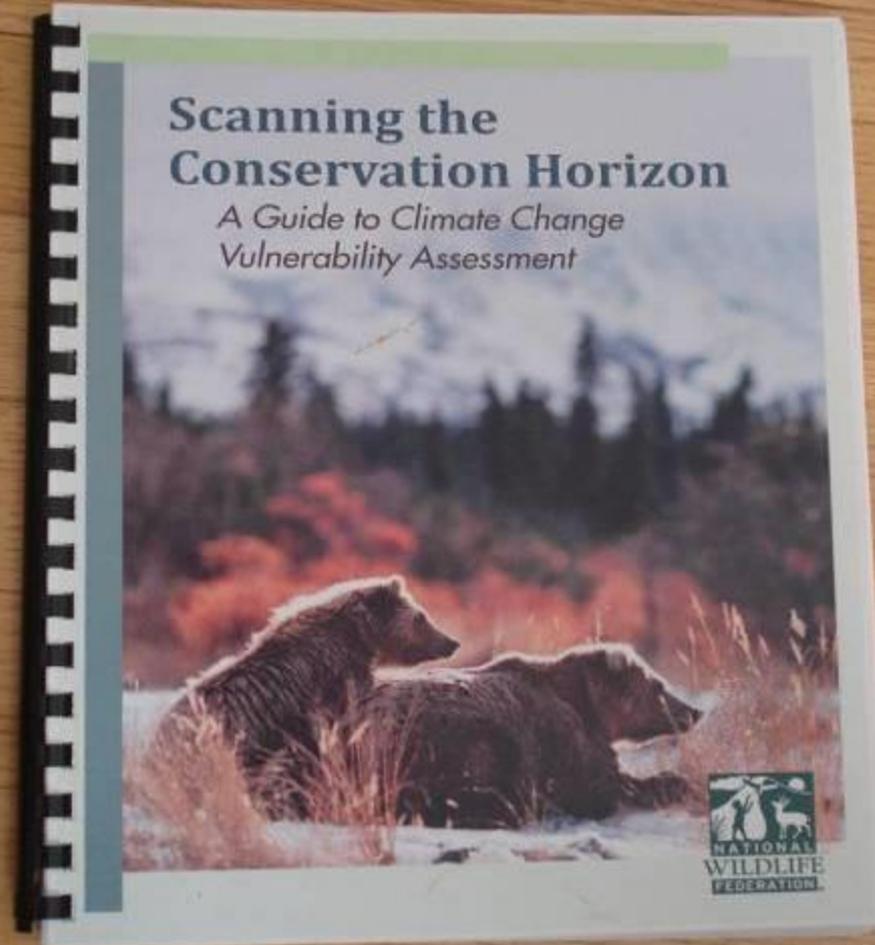
- ◆ Northeast has been “incubator” for VA methods
- ◆ Began in MA and CT about 5 years ago

# NORTHEAST TAKES LEAD IN VA

Most northeastern states are doing or have completed VAs:

MA	Complete (habitats/species)
CT	Complete (species)
NY	Underway (habitats/species)
NJ	Underway (habitats)
ME	Complete (habitats/ species)
VT	Underway (habitats and species)
VA	Underway
WV	Underway
NH	Underway
PA	Underway
MD	Complete

# VA GUIDANCE



# NORTHEASTERN REGIONAL VA - WHY

- ◆ Effective adaptation must be at regional level
- ◆ States/agencies need to collaborate
- ◆ We need an adaptation REGGI.



# NEAFWA REGIONAL VULNERABILITY ASSESSMENT PROJECT - GOALS

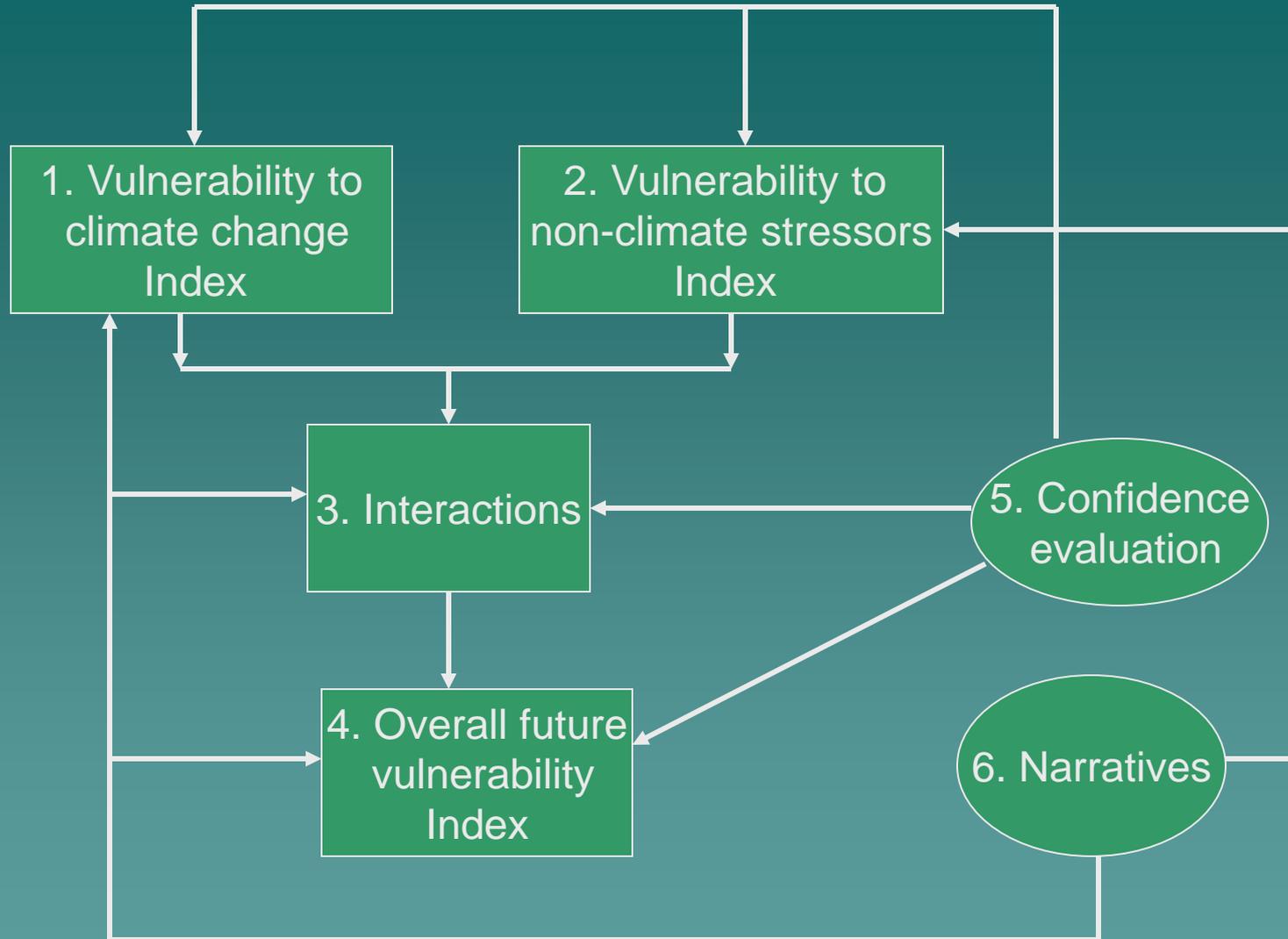
## Major objectives:

- map variation in habitat/species vulnerabilities across NE - provide states with regional context for conservation decisions
- provide states with basis for more detailed vulnerability analyses
- identify potential adaptation opportunities
- build capacities within state agencies

# NEAFWA REGIONAL VA - PROCESS

1. Convene expert panel of state, federal, NGO personnel
2. Develop predictive and quantitative habitat vulnerability model
3. Test model and modify
4. Form habitat expert workgroups
5. Select habitats for analyses
6. Run model on habitats

# THE NEAFWA HABITAT VULNERABILITY MODEL



# VULNERABILITY?

1. **Critically vulnerable** – likely to be lost entirely even under modest cc assumptions
2. **Highly vulnerable** – most may be lost even under modest cc assumptions
3. **Vulnerable** – as much as 50% of habitat could be lost, especially under tripling assumptions
4. **Less vulnerable** – may not experience much change
5. **Least vulnerable** – marked increase in extent in Region

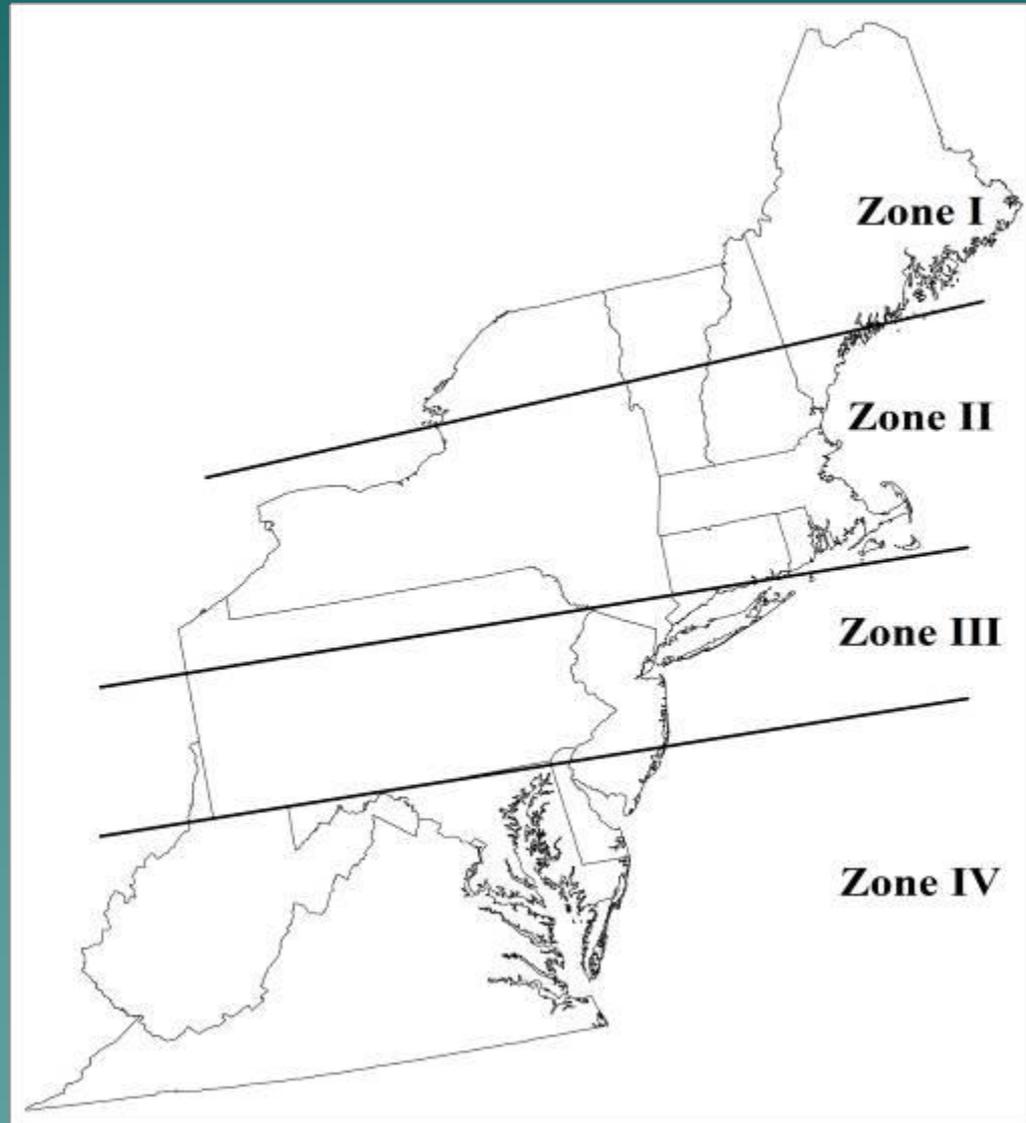
# CONFIDENCE SCORE

- ◆ High -  $>70\%$
- ◆ Medium - 30-70%
- ◆ Low -  $<30\%$

# NEAFWA MODEL – WIDER APPLICATION

- ◆ New Jersey
  - ◆ New York
  - ◆ Maryland
  - ◆ South Dakota (National Parks)
  - ◆ Rocky Mountains (Forest Service)
- 
- A stylized silhouette of a mountain range in shades of teal, located at the bottom right of the slide.

# REGIONAL ZONES



## Vulnerability varies geographically

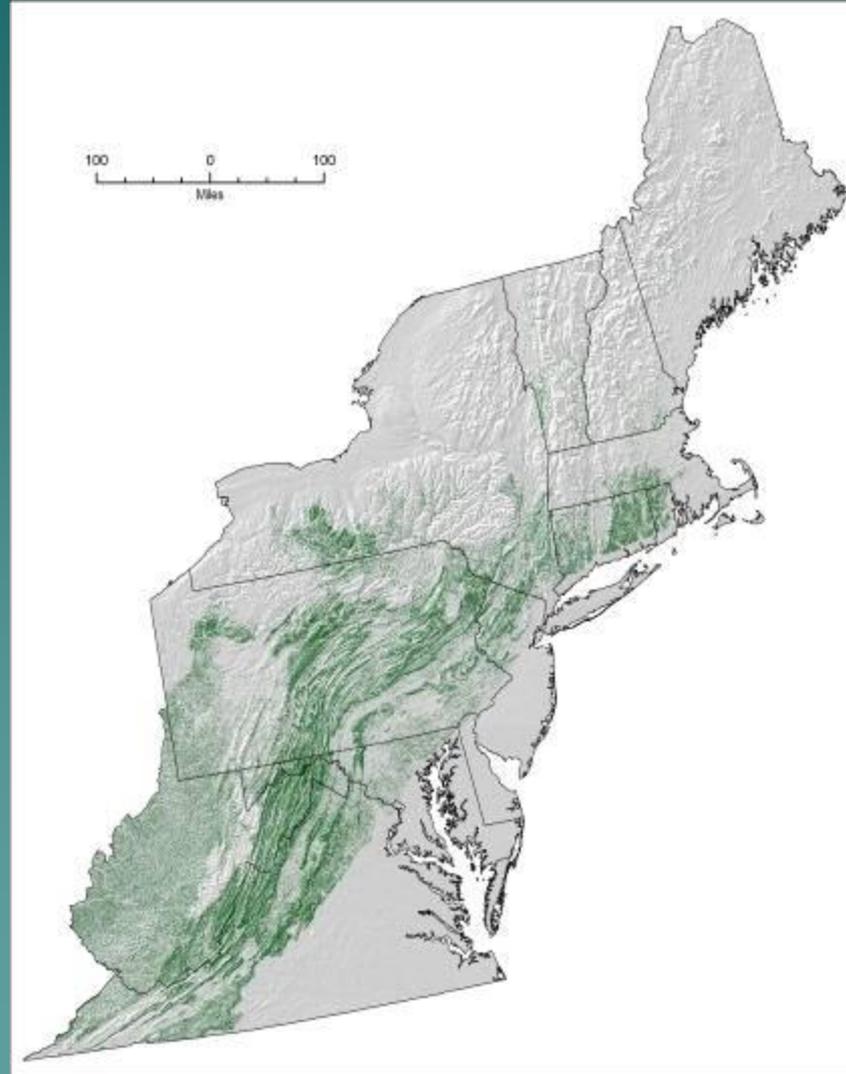
	Zone I	Zone II	Zone III	Zone IV
Acadian-Appalachian Alpine Tundra	Highly Vulnerable			
Acadian-Appalachian Montane Spruce-Fir Forest	Vulnerable	Critically Vulnerable		
Laurentian-Acadian Northern Hardwood Forest	Less Vulnerable	Vulnerable	Vulnerable	Critically Vulnerable
Central Mixed Oak-Pine Forests	Least Vulnerable	Least Vulnerable	Less Vulnerable	Vulnerable
Pitch Pine Barrens		Less Vulnerable	Less Vulnerable	Less Vulnerable
Northern Atlantic Coastal Plain Basin Peat Swamp		Less Vulnerable	Less Vulnerable	Less Vulnerable
Central and Southern Appalachian Spruce-Fir Forest				Critically Vulnerable
Boreal-Laurentian Bog	Highly Vulnerable	Highly Vulnerable		
Shrub Swamp	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Emergent Marsh	Vulnerable	Vulnerable	Vulnerable	Vulnerable

# SOME HABITATS WILL BENEFIT, OR WILL THEY?

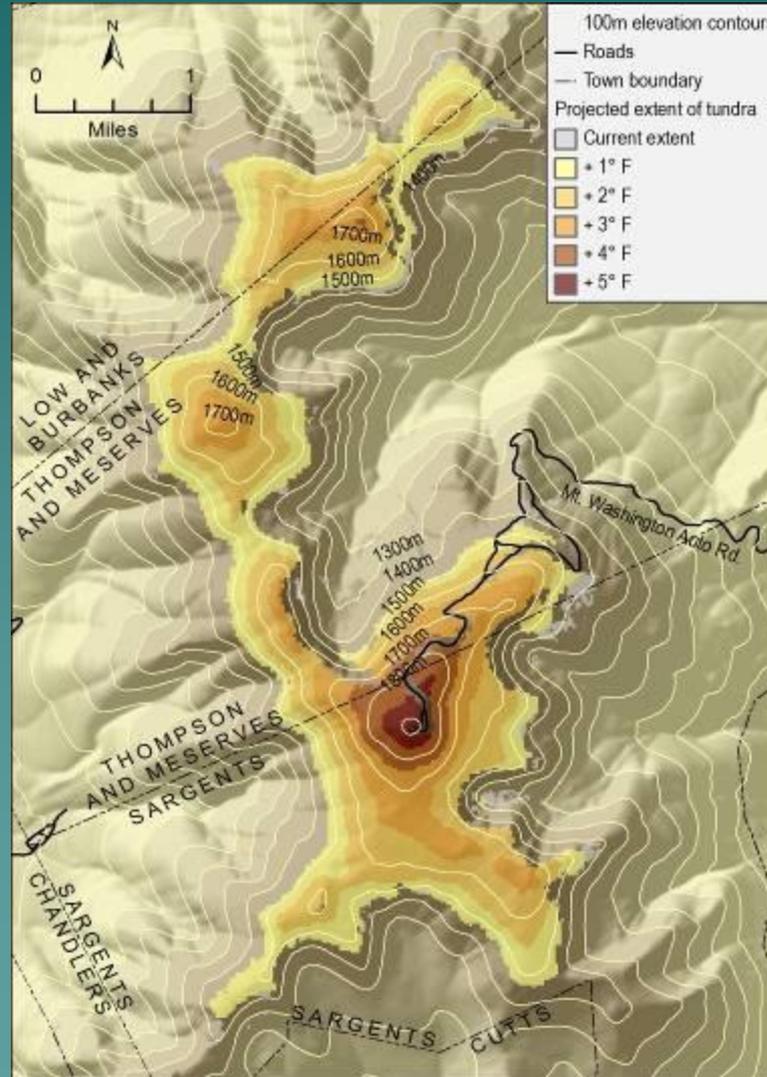
Central Mixed Oak-pine Forest



# SOME HABITATS WILL BENEFIT, OR WILL THEY?



# FRAGMENTATION MAY ALSO BE IMPORTANT



# CLIMATE-SCHLIMATE!

Habitat	Climate change Vulnerability	Non-climate change vulnerability
Tundra	Highly Vulnerable	Vulnerable
Pine Barrens	Least Vulnerable	Vulnerable
Shrub Swamp	Less Vulnerable	Vulnerable
Southern Spruce-Fir	Critically Vulnerable	Critically Vulnerable

# NEAFWA vs CCVI

- ◆ Foundational and keystone species in threatened habitats:
  - Red spruce and balsam fir in montane spruce forests

Good idea to run different models and test results

# INTERVENTION POINTS?

Habitat	Habitat Destruction	Pests	Invasives
Tundra	Acid deposition Wind energy development	Maybe	Maybe
Montane Spruce-Fir Forest	Acid deposition Wind energy development Biofuel development Natural gas/oil	Yes	Yes
Northern Hardwoods	Acid deposition Wind energy development Biofuel development Natural gas/oil	Yes	Yes
Cold water fish habitat	Dams Impermeable surfaces Riparian shading Contaminants	Maybe	Maybe