

### Using Vulnerability Assessment Results to Inform Agency Decisions




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National Park Service  
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### Session Goals

- Describe information generated by VAs
- Illustrate how information from VAs has been used by agencies
- Illustrate future uses of information from VAs



Whitebark pine, Crater Lake NP. Photo by R. Smieszko

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### Adaptation Framework





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### Adaptation Framework

- Monitoring plans
- Foundation doc
- CCP

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### Adaptation Framework

Exposure      Sensitivity

Potential Impact      Adaptive Capacity

Vulnerability

What is at risk?  
Why?

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### Adaptation Framework

Paper Birch

Habitat lost  
Habitat stable  
New habitat

(Swainston et al. 2011)

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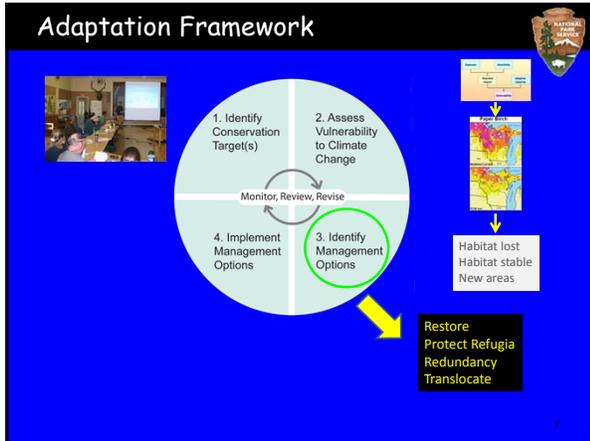
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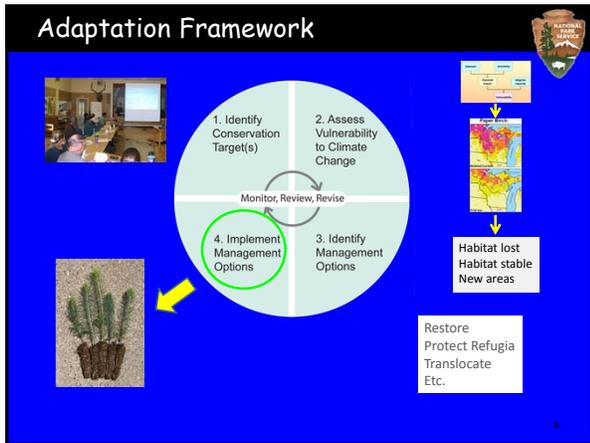
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### Case 1: Massachusetts Habitats and Species

Manomet and Massachusetts Division of Fisheries & Wildlife. 2010. Three volumes.

Thanks to John O'Leary.

CLIMATE CHANGE AND MASSACHUSETTS FISH AND WILDLIFE:

Volume 2  
HABITAT AND SPECIES VULNERABILITY

[http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs\\_climate\\_change\\_reports.htm](http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs_climate_change_reports.htm)

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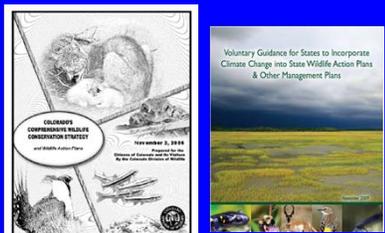
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**Goal**

- To ensure the wildlife conservation strategies detailed in the State Wildlife Action Plan (SWAP) are adapted for climate change impacts
- **Your project goal is to assess the vulnerability to climate change impacts of whatever is under your responsibility**



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**Massachusetts Vulnerability Assessment**

Key question:

- How do the SWAP-targeted fish and wildlife habitats rank in terms of their likely comparative vulnerabilities to climate change?
- How will the representation of these habitats in Massachusetts be altered by a changing climate?
- Which vertebrate Species in Greatest Need of Conservation are likely to be most vulnerable to climate change?
- What degree of confidence can be assigned to the above predictions?

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**Massachusetts Study**

- Expert panel evaluated climate and non-climate threats
- Scores used to identify and rank risk
- Focused on 20 habitat types in Massachusetts



(Photo: MA Dept. Envir. Protection)

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Example assessment results for habitats.

Habitat	Vuln. Scores	Cold adapted	High Elev	Northern Habitat	Southern Habitat	Vuln to Fire	Vuln to Pest Outbreaks
Small Coldwater Lakes	7/7	Yes	Yes	Yes	No	No	No
Spruce-fir Forest	6/7	Yes	Yes	Yes	No	Yes	Yes
Coldwater Rivers	5/6	Yes	Yes	No	No	No	No
Vernal Pools	4/5	No	No	No	No	No	No
Shrub Swamp	4/2	No	No	No	No	No	No
Central/Southern Hardwoods	1/1	No	No	No	Yes	No	No
Warmwater Aquatic	2/2	No	No	No	Yes	No	No

(Manomet & Mass. Fish & Wildl. 2010. Volume 2)

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High-ranked habitats (6 or 7) and associated vertebrate Species in Greatest Need of Conservation (SGNCs) most at risk from a doubling of atmospheric CO2 concentration

	Spruce-fir Boreal Swamp	Smaller Coldwater Ponds	Brackish Marsh	Intertidal Mudflat and Sandflat
Sharp-shinned Hawk	Blue-spotted Salamander	Northern Leopard Fron	Diamondback Terrapin	Peregrine Falcon
Blackpoll Warbler	Sharp-shinned Hawk	American Eel	American Bittern	Piping Plover
White-throated Sparrow	American Woodcock	White Sucker	Least Bittern	Ruddy Turnstone
Moose	Moose	Green Heron	Northern Harrier	Sanderling

(Manomet & Mass. Fish & Wildl. 2010. Volume 2)

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Narratives describe key attributes, threats, uncertainties, and considerations.

**PITCH PINE-SCRUB OAK VULNERABILITY EVALUATION**

*NHIFCS category: Northeastern Interior Pine Barrens/North Atlantic Coastal Plain Pitch Pine barrens*  
*State ranking: S2*

Vulnerability score: 4 (both emissions scenarios)  
 Confidence evaluation: Medium

**Rationale**

Its range extending south to New Jersey and Maryland, this community type reaches its northern limit on sandy, nutrient-poor, drought-prone soils in southern Maine, on Cape Cod, in the southern part of the Massachusetts coastal plain, and in the Connecticut River Valley (see Massachusetts Natural Heritage and Endangered Species Program map below). It is therefore a southern community type that extends into southern and central New England. Its canopy is dominated by Pitch Pine, with an understory of Scrub Oak, Huckleberry, and Lowbush Blueberry. The system is fire-maintained and will revert to White Pine or oak-dominated forest in the absence of fire (NHESP, 2007).

Distribution of Pitch Pine - Scrub Oak Communities in Massachusetts (April 2007)

(Manomet & Mass. Fish & Wildl. 2010. Volume 2)

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### Using the Vulnerability Assessment Results

- **Management:** Develop site Management Plans for a limited number of Wildlife Management Areas
- **Acquisition:** Add results of the Vulnerability Assessment under threats in existing land acquisition process
- **Regulation:** CC may require changes to existing regulations: intermittent versus perennial stream designation, allowed wetlands protection measures
- **Monitoring:** Working with USGS to develop a plan that will include wetlands and other high-ranked aquatic habitat types

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### What doing a Vulnerability Assessment Achieved for MDFW

- Got a seat at the table for fish and wildlife in the State Adaptation Plan
- Got our staff in the game
- You can give the short "yes" answer instead of the long "no" with an explanation
- Moved beyond platitudes

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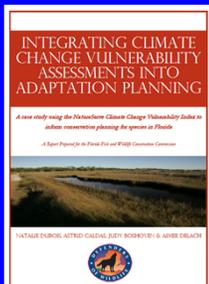
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### Incorporating climate change into the Florida Fish & Wildlife Conservation Commission Wildlife Action Plan

Thanks to Natalie Dubois



Natalie Dubois, Astrid Caldas, Judy Boshoven, and Aimee Delach 2011.

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**Key Questions**

Which species or systems are likely to be most affected?  
 What factors contribute to vulnerability?




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**Florida VA Case study**

- Pilot an available tool as part of a vulnerability assessment for a set of Florida species  
 –NatureServe Climate Change Vulnerability Index (CCVI)
- Use this assessment to inform the design of climate change adaptation strategies as part of a planning process (SWAP)
- Understand how this approach might inform and be integrated with other approaches to vulnerability assessment

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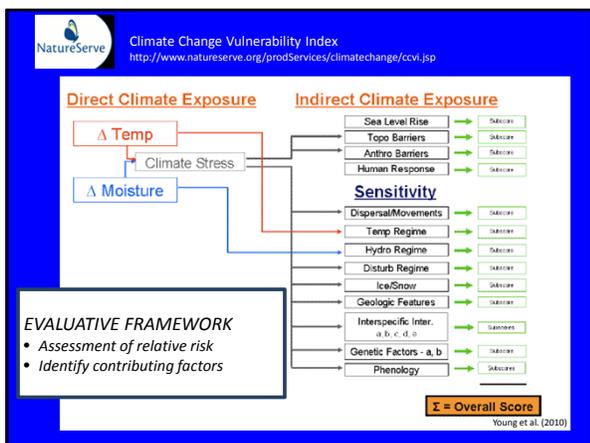
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**NatureServe** Climate Change Vulnerability Index  
<http://www.natureserve.org/prodServices/climatechange/ccvi.jsp>

Worked with species experts to assign factor scores

**Indirect Climate Exposure**

- Sea Level Rise → Subfactor
- Topo Barriers → Subfactor
- Anthro Barriers → Subfactor
- Human Response → Subfactor

**Sensitivity**

- Dispersal/Movements → Subfactor
- Temp Regime → Subfactor
- Hydro Regime → Subfactor
- Disturb Regime → Subfactor
- Ice/Snow → Subfactor
- Geologic Features → Subfactor
- Interspecific Inter. a, b, c, d, e → Subfactor
- Genetic Factors - a, b → Subfactor
- Phenology → Subfactor

**Σ = Overall Score**

Vulnerability factor	GI	I	SI	N	SD	D	Other
Sea level rise							
Natural barriers							
Anthropogenic barriers							
Human responses to CC							
Dispersal							
Historical thermal niche (δS)							
Physiological thermal niche							
Historical hydrologic niche (δH)							
Physiological hydrologic niche							
Disturbance regimes							
Ice and snow							
Fluvial habitat specificity							
Evac habitat dependence							
Dietary versatility							
Biotic dispersal dependence							
Dietary interactions: none							
Genetics: variation							
Phenological response							

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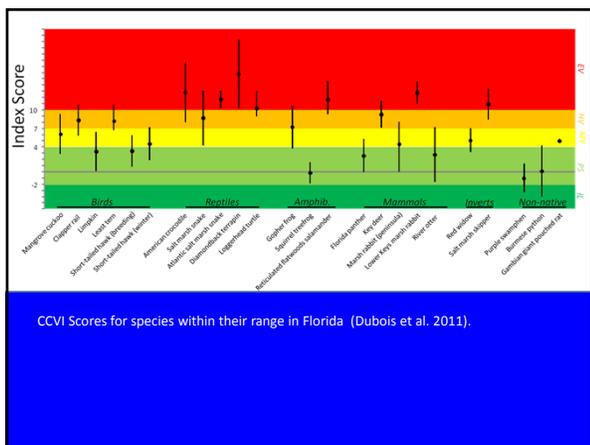
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- Relative ranks can provide information regarding *which* resources are most vulnerable to CC
- Understanding *why* they are vulnerable provides a basis for developing appropriate management responses

→ Informs threat assessment and feeds into conservation planning framework

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### Informing agency decisions

- **Management:** Identify management actions that could be incorporated into species management plans
- **Acquisition:** Incorporate climate-related factors into land acquisition process
- **Policy:** Evaluate effectiveness of existing regulations under climate change
- **Research and Monitoring:** Address data gaps and key uncertainties

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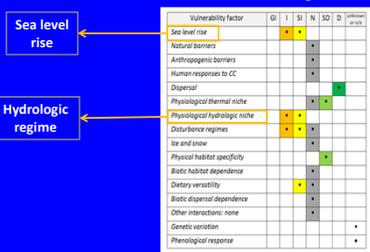
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### VA identifies influential factors contributing to vulnerability (threats, stresses)

Short-tailed hawk (MV)  
winter range




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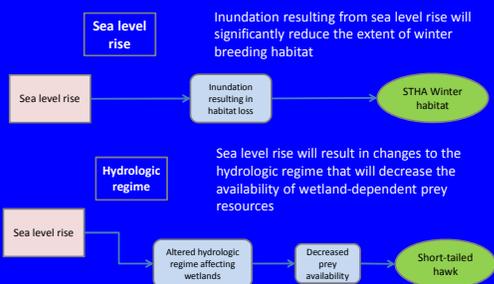
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### > Elucidate "hypotheses of change" (TNC 2009)




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Table 3. Workshop participants used the conceptual models to identify a set of priority strategies addressing climate-related threats for each focal species. Where spatially-explicit actions could be identified, these were integrated into the Alternative Futures approach and mapped on the landscape (see Flaxman and Vargas-Moreno 2011).

Potential priority strategies	
Short-tailed hawk	<p><b>PLANNING:</b> Ecologically-based community planning (targets breeding habitat)</p> <p><b>LAND PROTECTION:</b> Targeting potential or current habitat likely to be developed (breeding habitat)</p> <p><b>MANAGEMENT:</b> Restore public lands and protected private land in WMD and EAA (winter habitat)</p> <p><b>MANAGEMENT:</b> Indicator-based water management in response to fire (breeding habitat)</p> <p><b>MANAGEMENT:</b> Ensure that management plans require species-specific best management practices regarding forestry (breeding habitat)</p>
Least tern	<p><b>LAND PROTECTION:</b> Maintain natural storm buffers by protecting coastal land through fee-simple or easement acquisition</p> <p><b>PLANNING:</b> Draft model building codes for keeping gravel roads as nesting habitat</p> <p><b>MANAGEMENT:</b> Revise site (e.g., bank sill) bench during nesting season</p> <p><b>MANAGEMENT:</b> Reassessment of future using diadrye soils</p>
Atlantic Salt marsh snake	<p><b>LAND PROTECTION:</b> Protect corridors for inland migration of salt marsh via fee simple or easement acquisition.</p> <p><b>RESEARCH:</b> Model vegetation succession with downscaled sea level rise models</p> <p><b>POLICY:</b> Restore low elevation areas</p>
American crocodile	<p><b>RESEARCH:</b> Increase understanding of how mangroves will shift and appropriate vegetation management responses</p> <p><b>MONITORING:</b> Changes to population size, trends and habitat</p> <p><b>MANAGEMENT:</b> Create nesting nursery habitat if needed (as indicated by monitoring)</p> <p><b>POLICY:</b> Encourage water management in Everglades is consistent with crocodile management (impacts to salinity)</p> <p><b>RESEARCH:</b> Model effects of salt stress on crocodile population</p>
Florida panther	<p><b>PLANNING:</b> Conduct long-term spatial conservation planning to incorporate panther habitat into land use planning</p> <p><b>LAND PROTECTION:</b> Secure novel habitat corridors via fee simple or easement acquisition, especially for connecting rivers to river mouth of the Caloosahatchee River.</p> <p><b>MONITORING AND MANAGEMENT:</b> Maintain robust monitoring and maintain healthy panther population across current range to bolster resilience to future changes</p>
Key deer	<p><b>POLICY:</b> Develop a habitat conservation plan</p> <p><b>MANAGEMENT:</b> Fill/convert mosquito ditches</p> <p><b>LAND PROTECTION:</b> Fee-simple or easement acquisition, including road improvements</p> <p><b>RESEARCH:</b> Develop disease management</p> <p><b>MANAGEMENT:</b> Implement appropriate fire regime</p>

**Short-tailed hawk: Potential priority strategies**

**PLANNING:** Ecologically-based community planning (targets breeding habitat)

**LAND PROTECTION:** Targeting potential or current habitat likely to be developed (breeding habitat)

**MANAGEMENT:** Restore public lands and protected private land in the water management district and Everglades Agric. Area (winter habitat)

**MANAGEMENT:** Indicator-based water management in response to fire (breeding habitat)

**MANAGEMENT:** Ensure that management plans require species-specific best management practices regarding forestry

(Dubois et al. 2011. Integrating climate change vulnerability assessments into adaptation planning .)

**Summary**

- VAs provide information on *what* is at risk, *why*, and about uncertainty
- This informs:
  - Allocation of resources
  - What action to take: acquisition, habitat mgmt, research, protection, etc.
  - Where to take action

Vulnerability assessments are a key step toward climate change adaptation.



Photo by Craig Allen