# Using Vulnerability Assessment Results to Inform Agency Decisions

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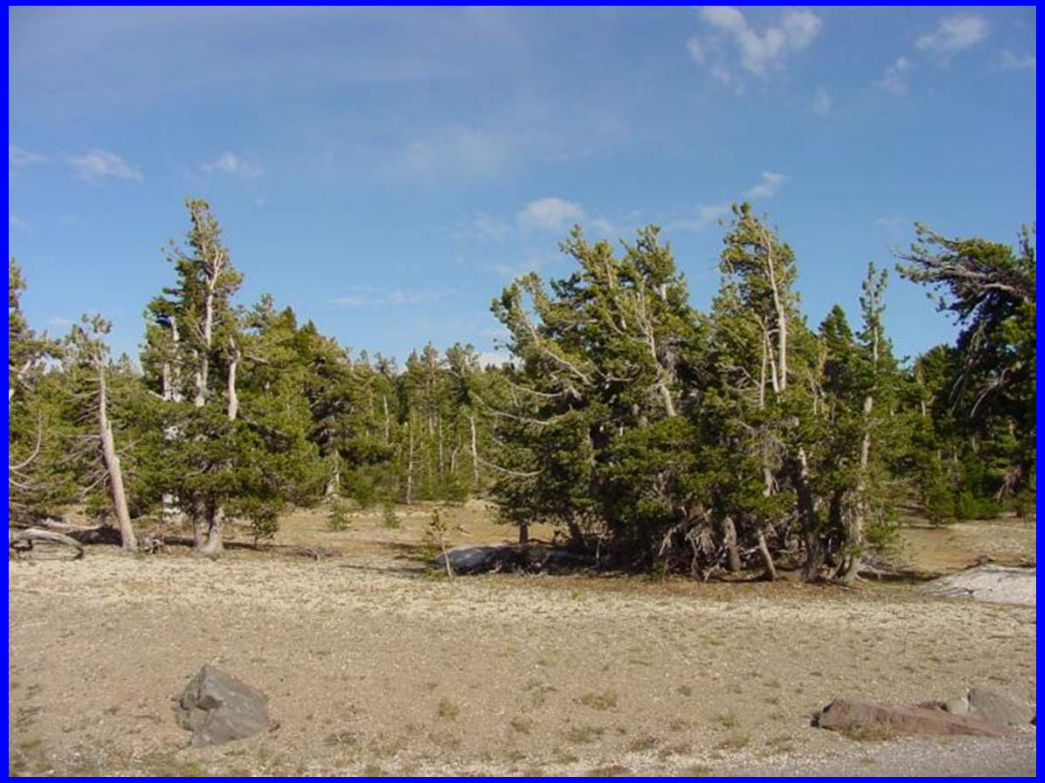
Climate Change Vulnerability Assessment Training
Ft Collins, CO  20-22 March 2012

# Session Goals

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

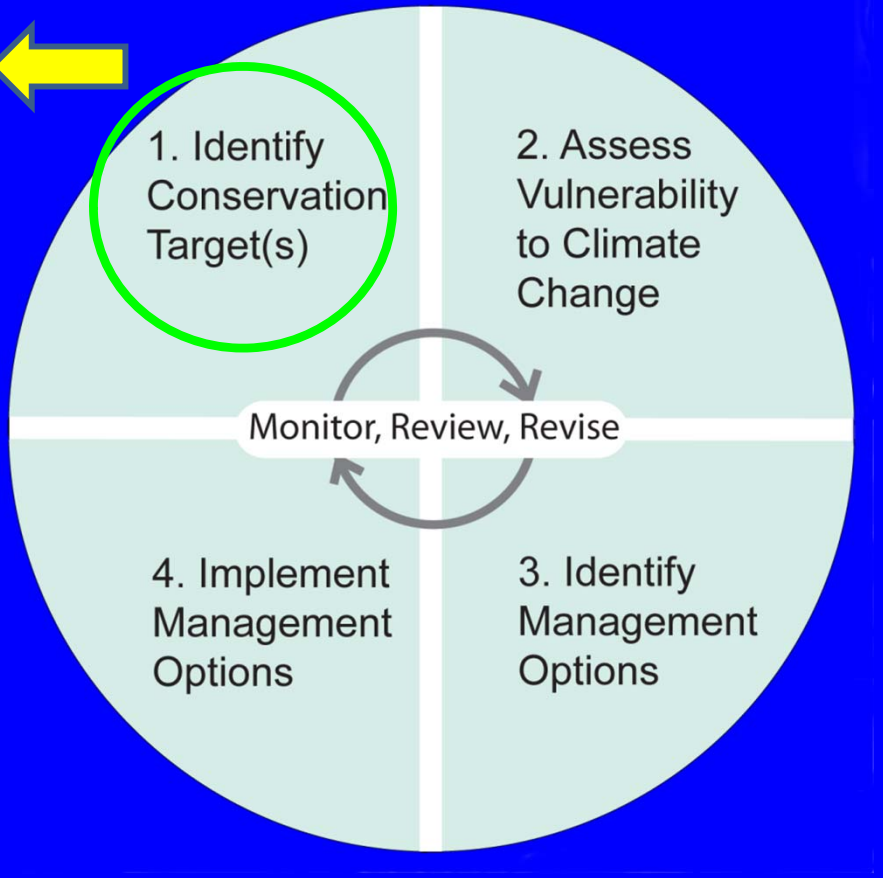


Whitebark pine, Crater Lake NP.  Photo by R. Sniezko

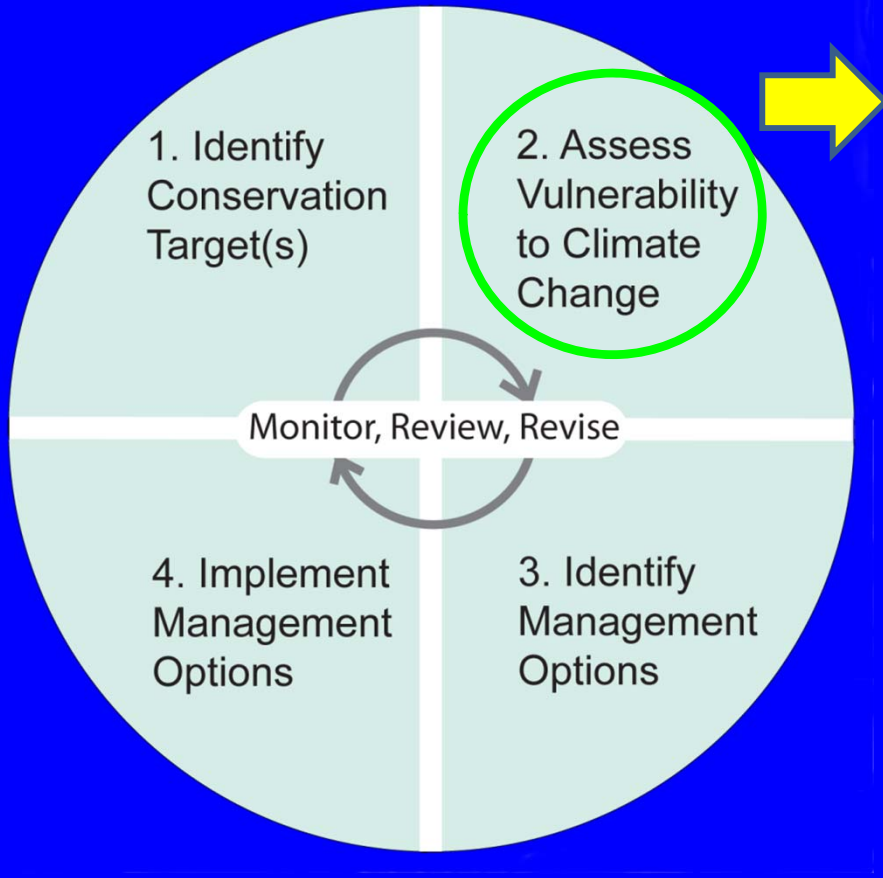
# Adaptation Framework

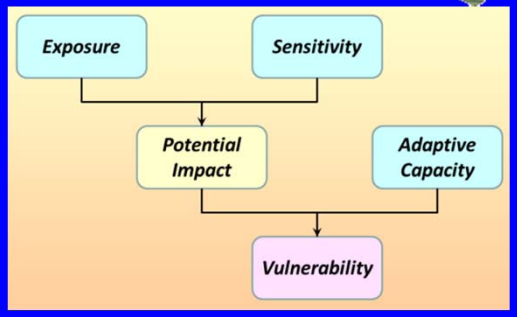
# Adaptation Framework

- Monitoring plans
- Foundation doc
- CCP



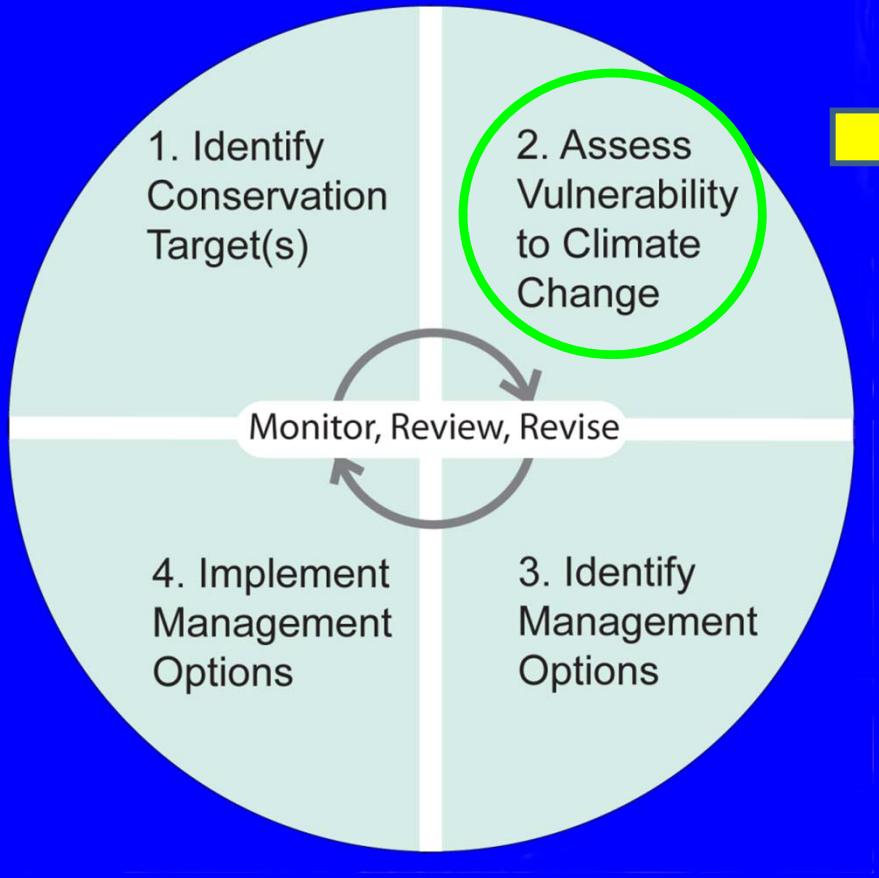
# Adaptation Framework

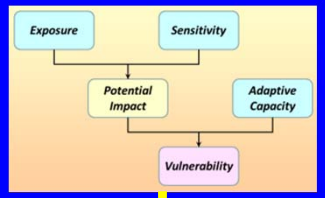


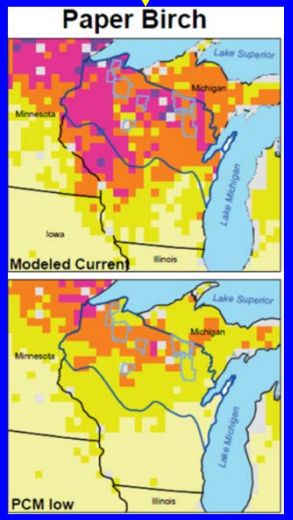




What is at risk?
Why?

# Adaptation Framework



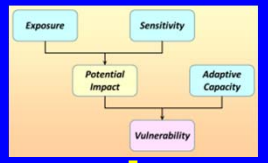



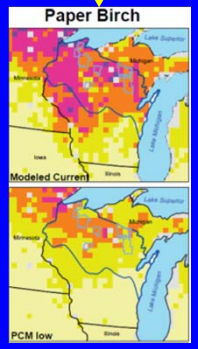




(Swanston et al. 2011)

Habitat lost
Habitat stable
New habitat

# Adaptation Framework


Habitat lost
Habitat stable
New areas

Restore
Protect Refugia
Redundancy
Translocate

# Adaptation Framework

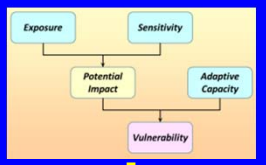
1. Identify Conservation Target(s)

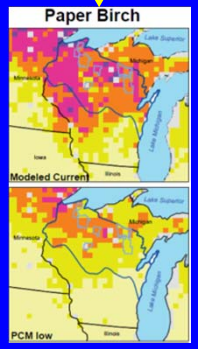
2. Assess Vulnerability to Climate Change

3. Identify Management Options

4. Implement Management Options

Monitor, Review, Revise




Habitat lost
Habitat stable
New areas

Restore
Protect Refugia
Translocate
Etc.

# Case 1: Massachusetts Habitats and Species

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

Thanks to John O'Leary.

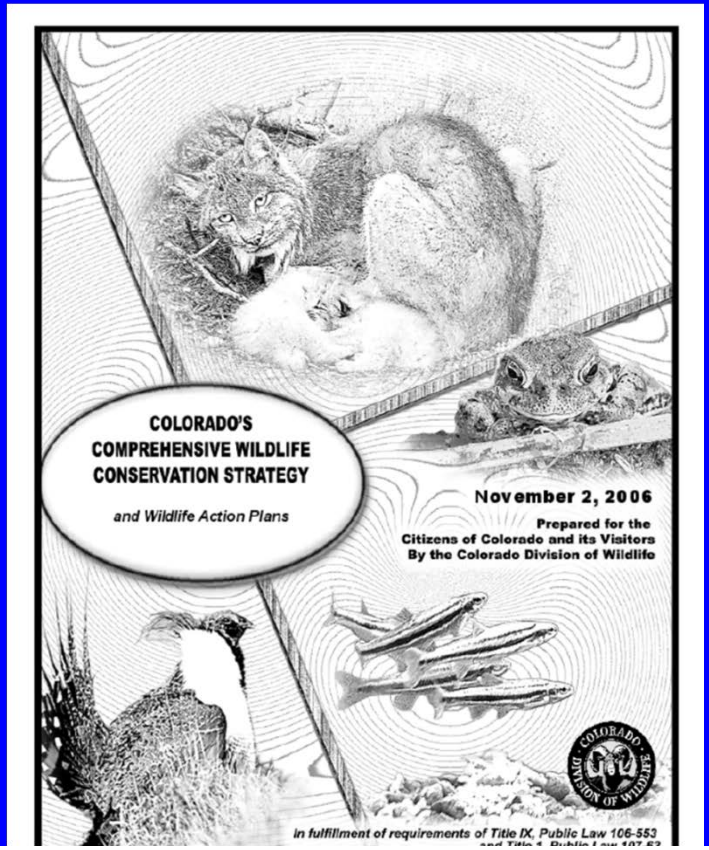
CLIMATE CHANGE AND MASSACHUSETTS FISH AND WILDLIFE:

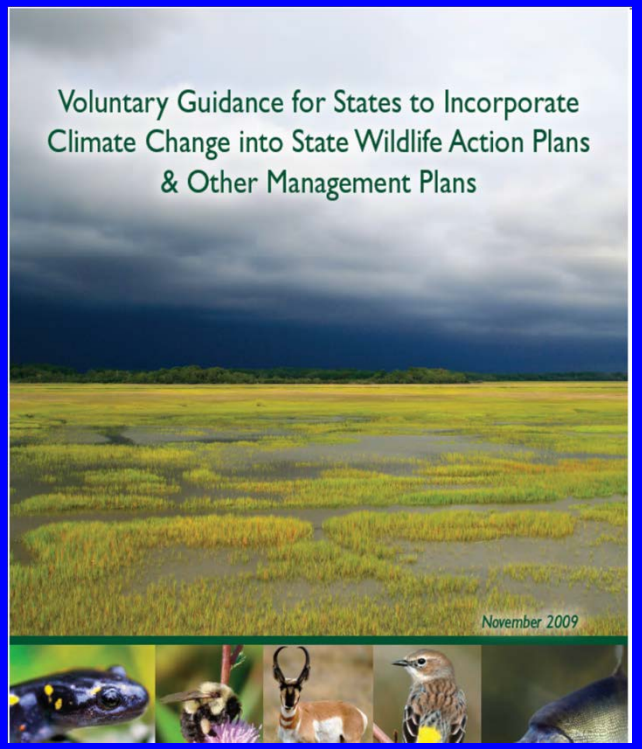
Volume 2
HABITAT AND SPECIES VULNERABILITY

http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs_climate_change_reports.htm

## 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**



# 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?

## 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)

## 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)

## 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 Forest | 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)

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

## PITCH PINE-SCRUB OAK VULNERABILITY EVALUATION

*NTWHCS 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)

# Using the Vulnerability Assessment Results

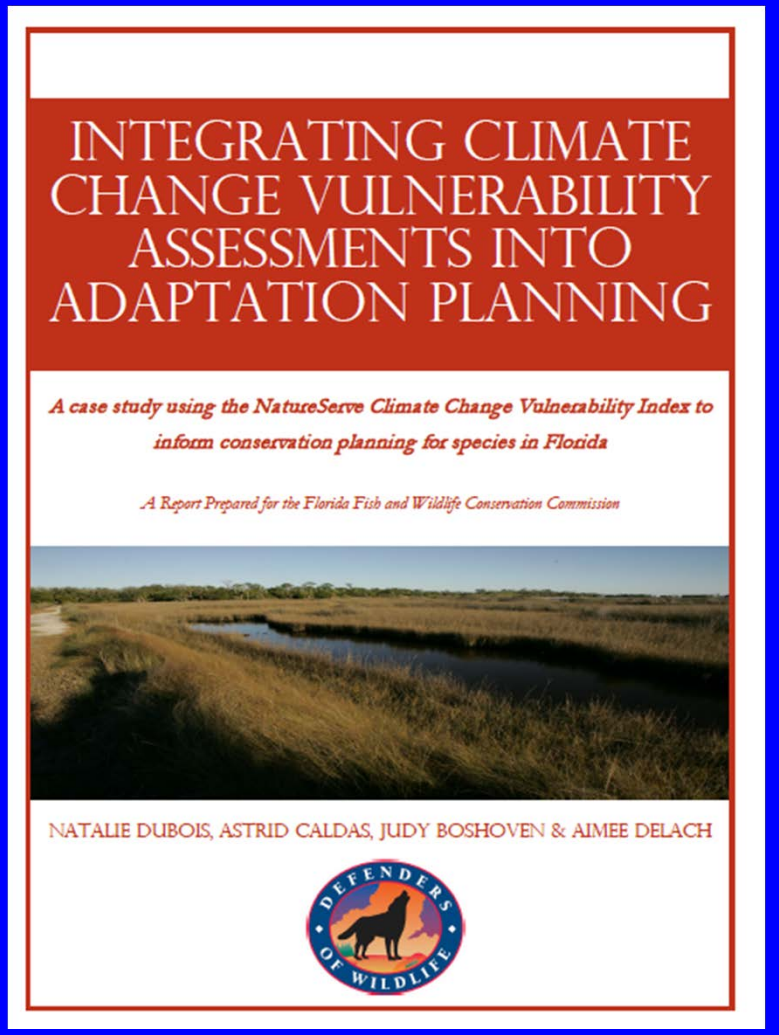
- **Management:**: Develop site Management Plans for a limited number of Wildlife Management Areas
- **Acquisition:** Add results of the Vulnerability Assessment under threats in existing land acquisition process
- **Regulation:** CC may require changes to existing regulations: intermittent versus perennial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

# 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

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

*Thanks to Natalie Dubois*

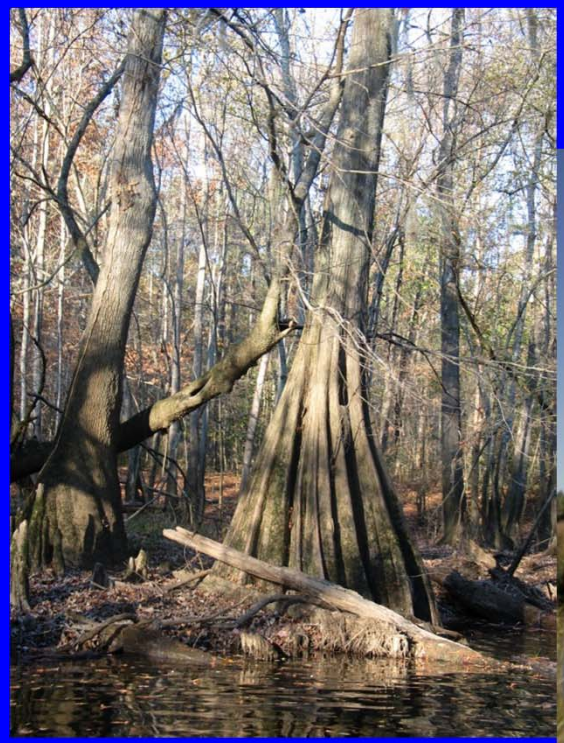



Natalie Dubois, Astrid Caldas , Judy Boshoven, and Aimee Delach 2011.

## Key Questions

Which species or systems are likely to be most affected?

What factors contribute to vulnerability?

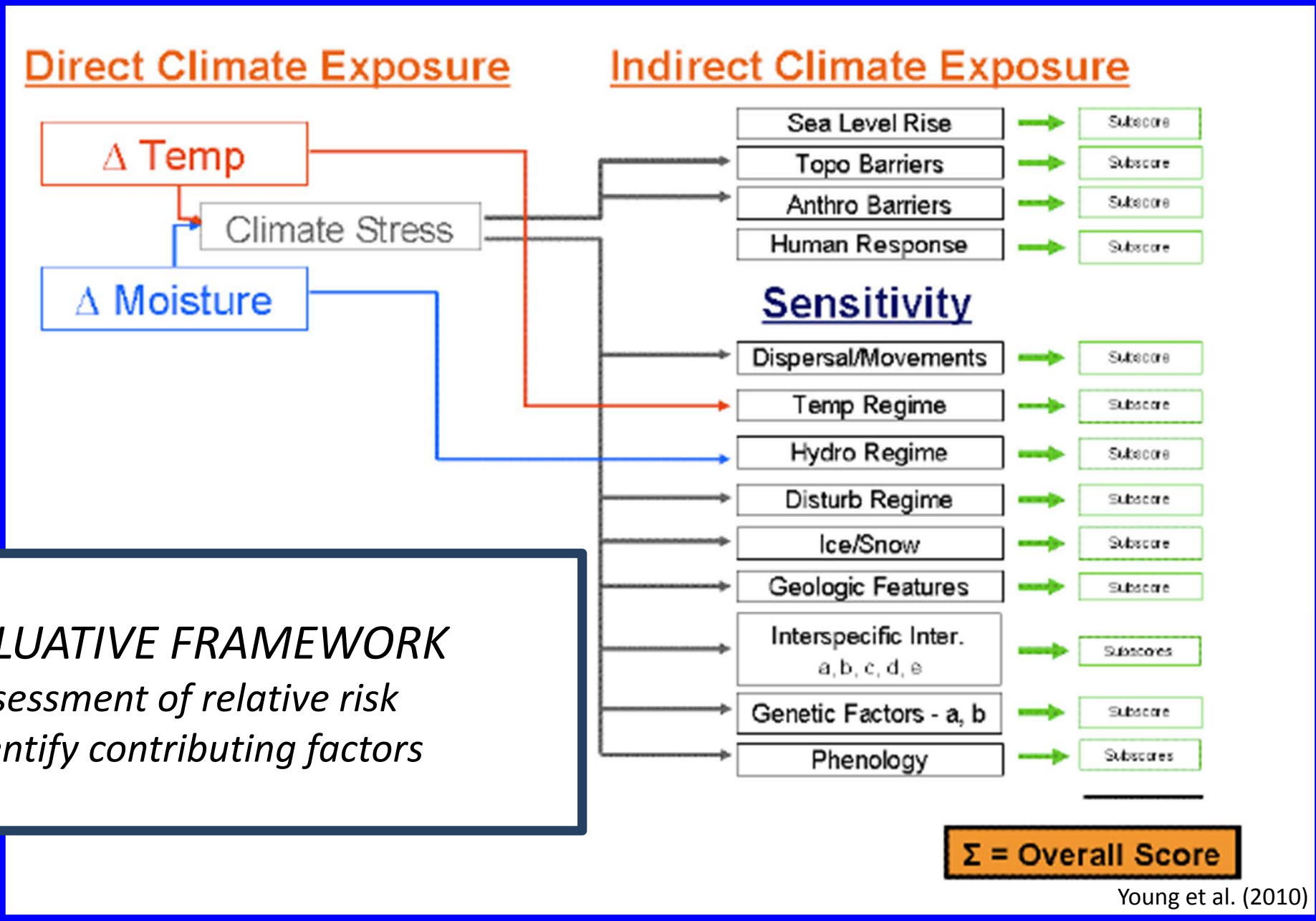


# Florida VA Case study

- 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

# Climate Change Vulnerability Index

http://www.natureserve.org/prodServices/climatechange/ccvi.jsp




*EVALUATIVE FRAMEWORK*

- *Assessment of relative risk*
- *Identify contributing factors*

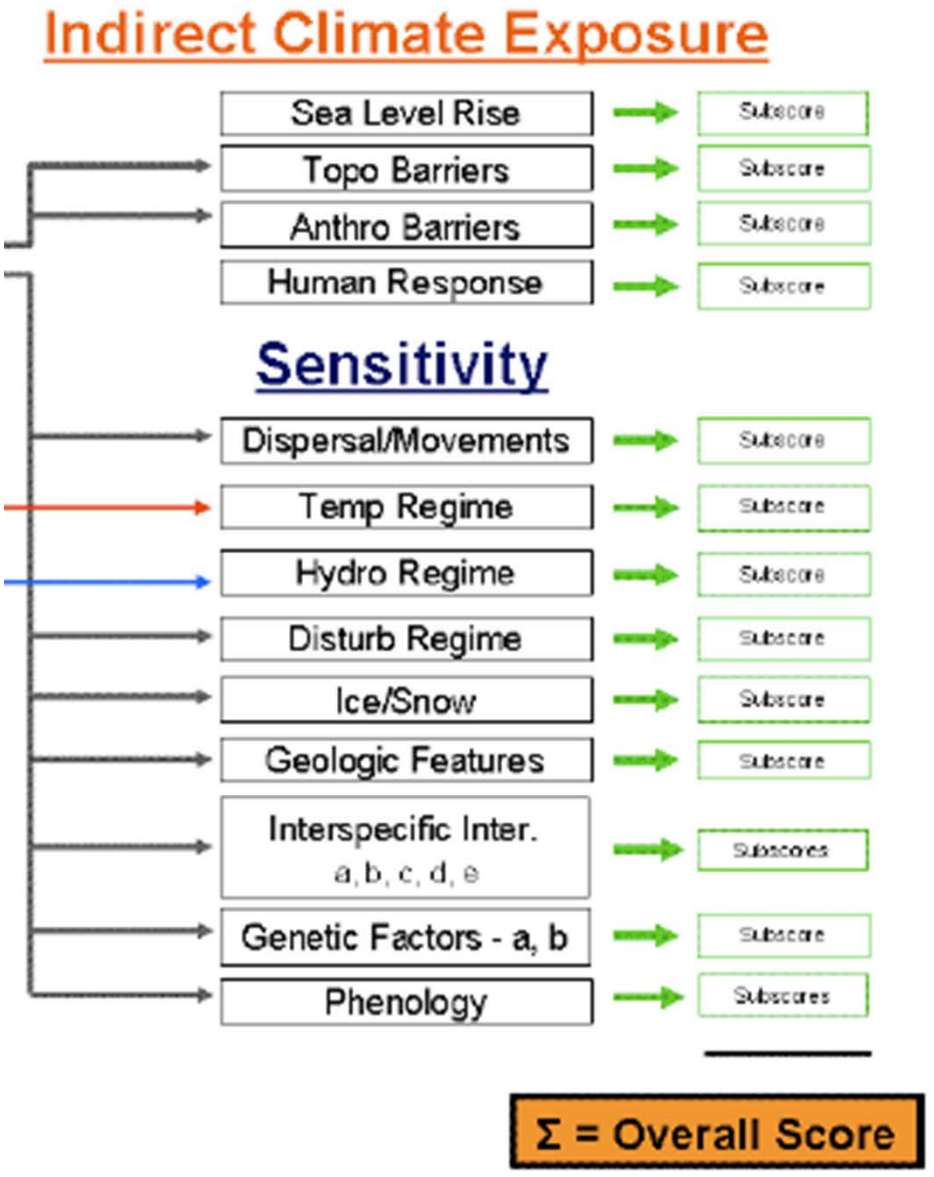
Young et al. (2010)

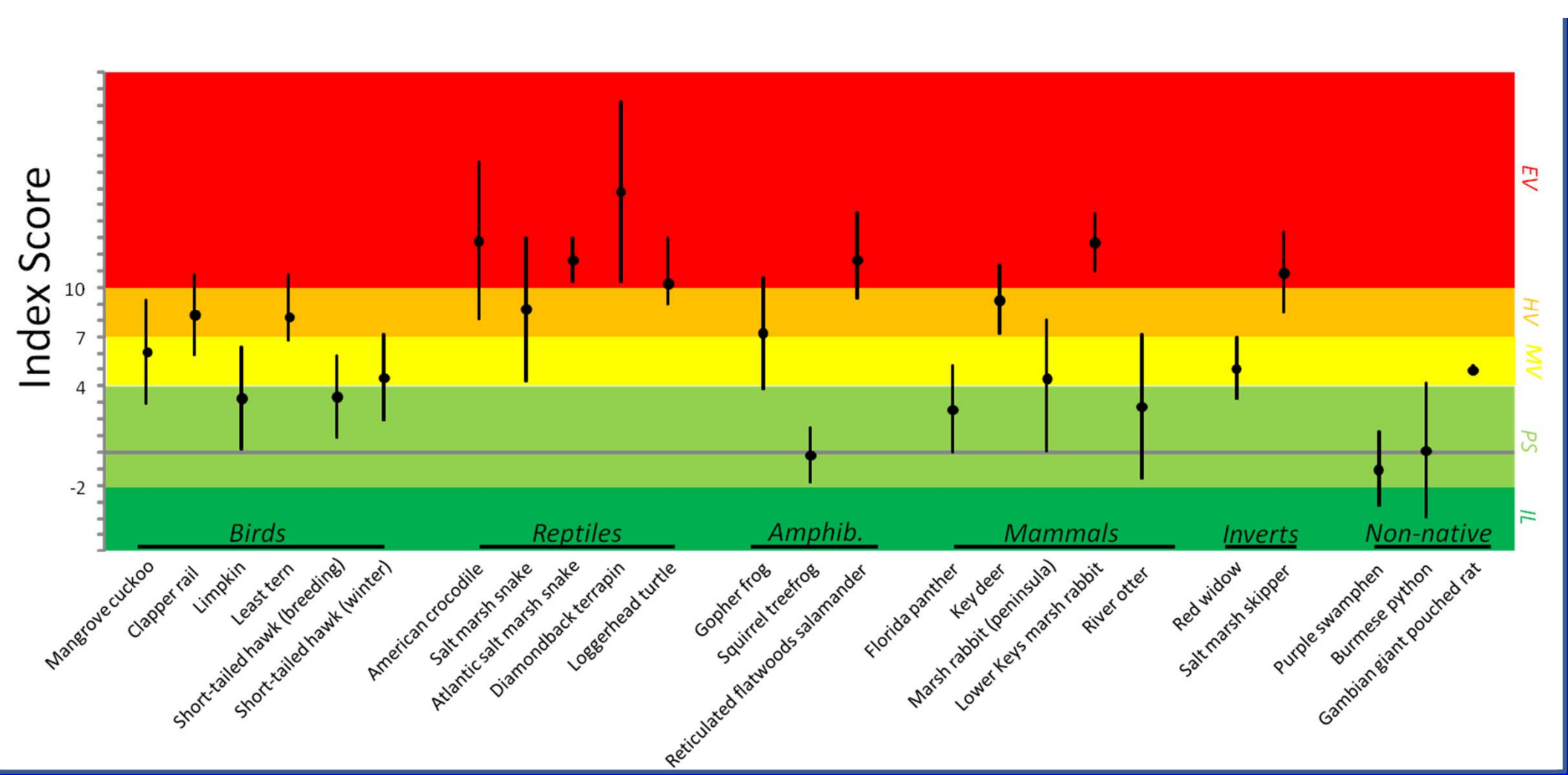
Climate Change Vulnerability Index
http://www.natureserve.org/prodServices/climatechange/ccvi.jsp

Young et al. (2010)

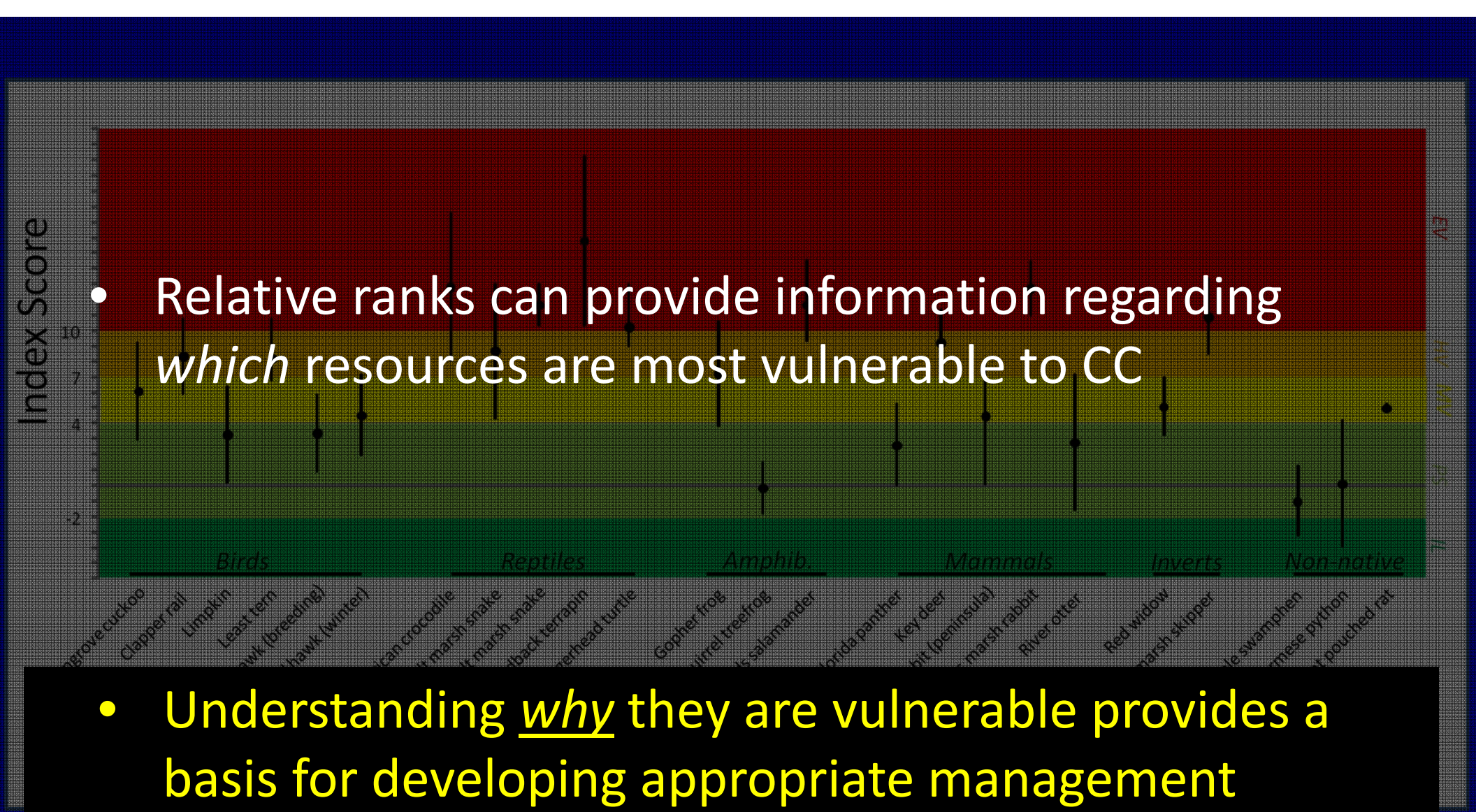
*Worked with species experts to assign factor scores*

| Vulnerability factor | GI | I | SI | N | SD | D | unknown or n/a |
|---|---|---|---|---|---|---|---|
| *Sea level rise* | | • | | | | | |
| *Natural barriers* | • | | | | | | |
| *Anthropogenic barriers* | | | | • | | | |
| ***Human responses to CC*** | | | | • | • | • | |
| *Dispersal* | | | | | • | | |
| *Historical thermal niche (GIS)* | • | | | | | | |
| *Physiological thermal niche* | | | | • | | | |
| *Historical hydrologic niche (GIS)* | | • | | | | | |
| *Physiological hydrologic niche* | | • | • | | | | |
| *Disturbance regimes* | | | • | | | | |
| *Ice and snow* | | | | • | | | |
| *Physical habitat specificity* | | | | • | • | | |
| *Biotic habitat dependence* | | | | • | | | |
| *Dietary versatility* | | | | • | | | |
| *Biotic dispersal dependence* | | | | • | | | |
| *Other interactions: none* | | | | • | | | |
| *Genetic variation* | | • | • | | | | |
| *Phenological response* | | | | | | | • |






CCVI Scores for species within their range in Florida (Dubois et al. 2011).




- Relative ranks can provide information regarding *which* resources are most vulnerable to CC

- Understanding <u>*why*</u> they are vulnerable provides a basis for developing appropriate management responses

→ Informs threat assessment and feeds into conservation planning framework

# 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

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

**Short-tailed hawk (MV)**
winter range

**Sea level rise**

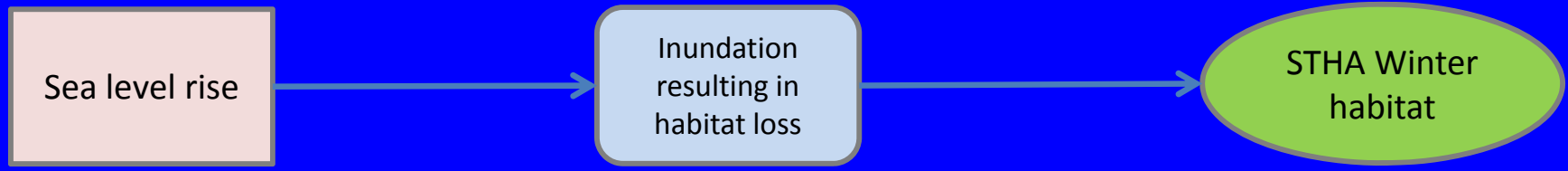
**Hydrologic regime**

| Vulnerability factor | GI | I | SI | N | SD | D | *unknown or n/a* |
|---|---|---|---|---|---|---|---|
| *Sea level rise* | | • | • | | | | |
| *Natural barriers* | | | | • | | | |
| *Anthropogenic barriers* | | | | • | | | |
| *Human responses to CC* | | | | • | | | |
| *Dispersal* | | | | | | • | |
| *Physiological thermal niche* | | | | • | • | | |
| *Physiological hydrologic niche* | | • | • | | | | |
| *Disturbance regimes* | | • | • | • | | | |
| *Ice and snow* | | | | • | | | |
| *Physical habitat specificity* | | | | | • | | |
| *Biotic habitat dependence* | | | | • | | | |
| *Dietary versatility* | | | • | • | | | |
| *Biotic dispersal dependence* | | | | • | | | |
| *Other interactions: none* | | | | • | | | |
| *Genetic variation* | | | | | | | • |
| *Phenological response* | | | | | | | • |

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

**Sea level rise**

Inundation resulting from sea level rise will significantly reduce the extent of winter breeding habitat




**Hydrologic regime**

Sea level rise will result in changes to the hydrologic regime that will decrease the availability of wetland-dependent prey resources

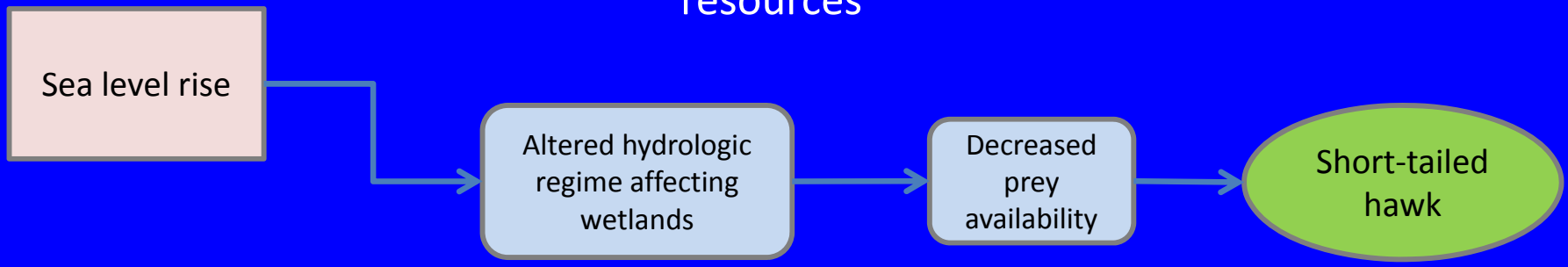


Table 3. Workshop participants used the conceptual models to identify a set of priority strategies addressing climate-related threats for each focal species. Where spatially-explicit actions could be identified, these were integrated into the Alternative Futures approach and mapped on the landscape (see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

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

# 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