Using Vulnerability Assessment Results to Inform Agency Decisions

Incorporating climate change into the FWC SWAP update

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NCTC Climate Change Vulnerability Assessment Course
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Contributors

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36 species experts

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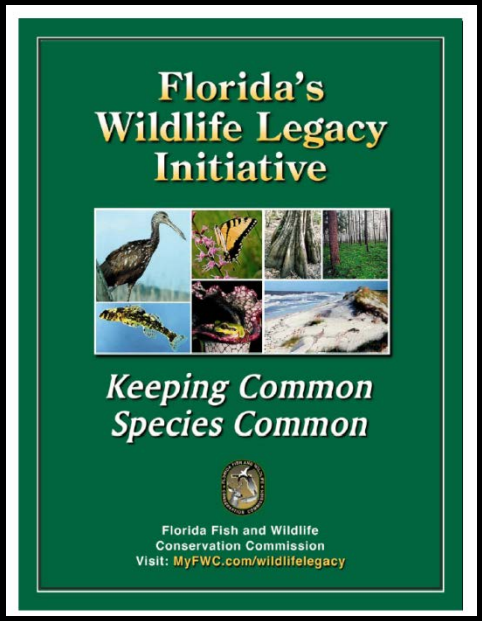
Support state wildlife agency efforts to address the impacts of climate change through their SWAPs

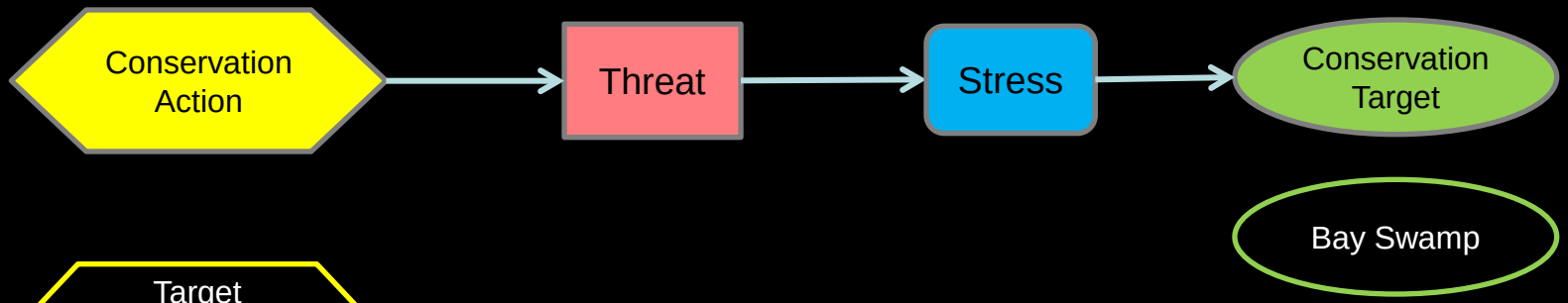
State Wildlife Action Plans

- identify priority species and habitats
- lay out the actions needed to conserve those resources

Florida Fish and Wildlife Conservation Commission (FWC) is in the process of updating the SWAP to better address impacts of climate change

- Identifies by habitat
  - Stresses
  - Sources of stress (Threats)
  - Conservation actions





Target easements in high priority areas

Management: controlled burns

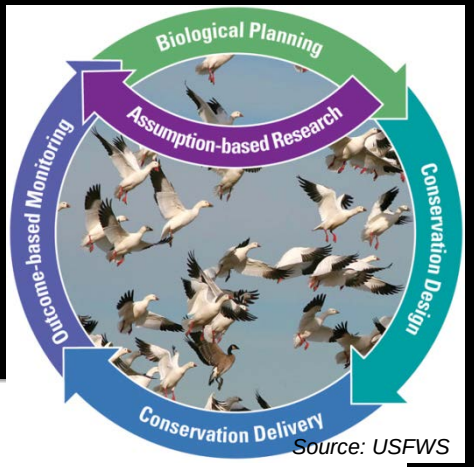
Conservation Action: Intervention undertaken to reach conservation goals

Strategic conservation planning frameworks

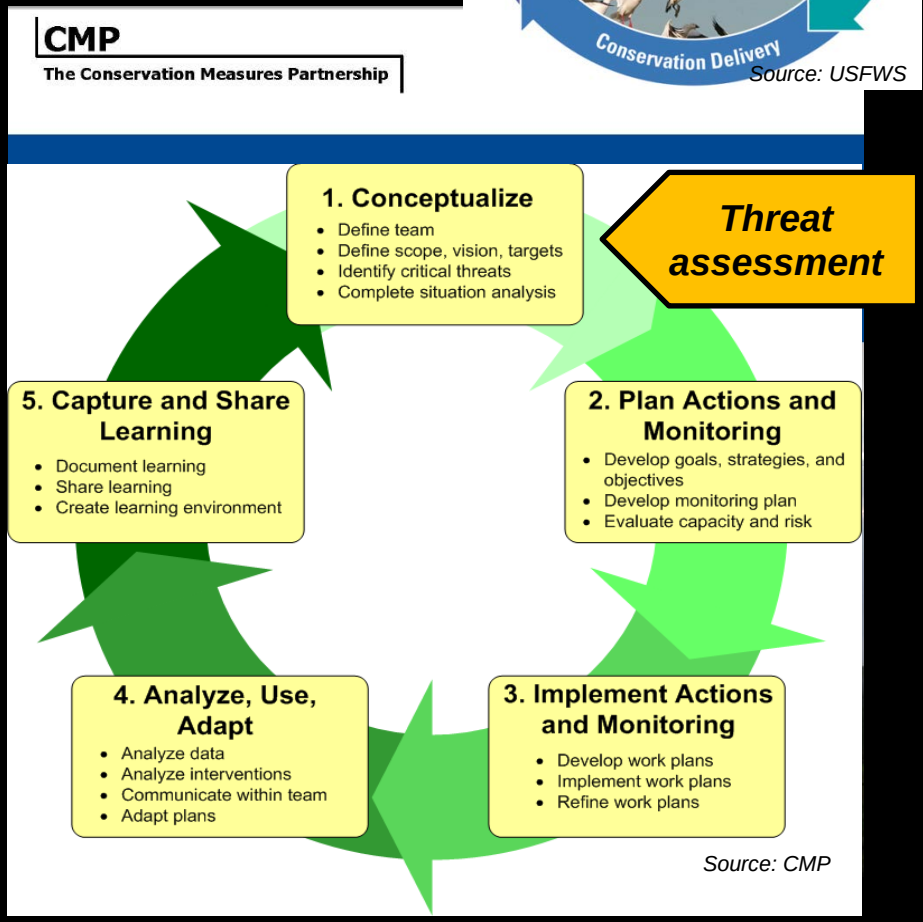
Once conservation targets identified…

Threat assessment and situation analysis

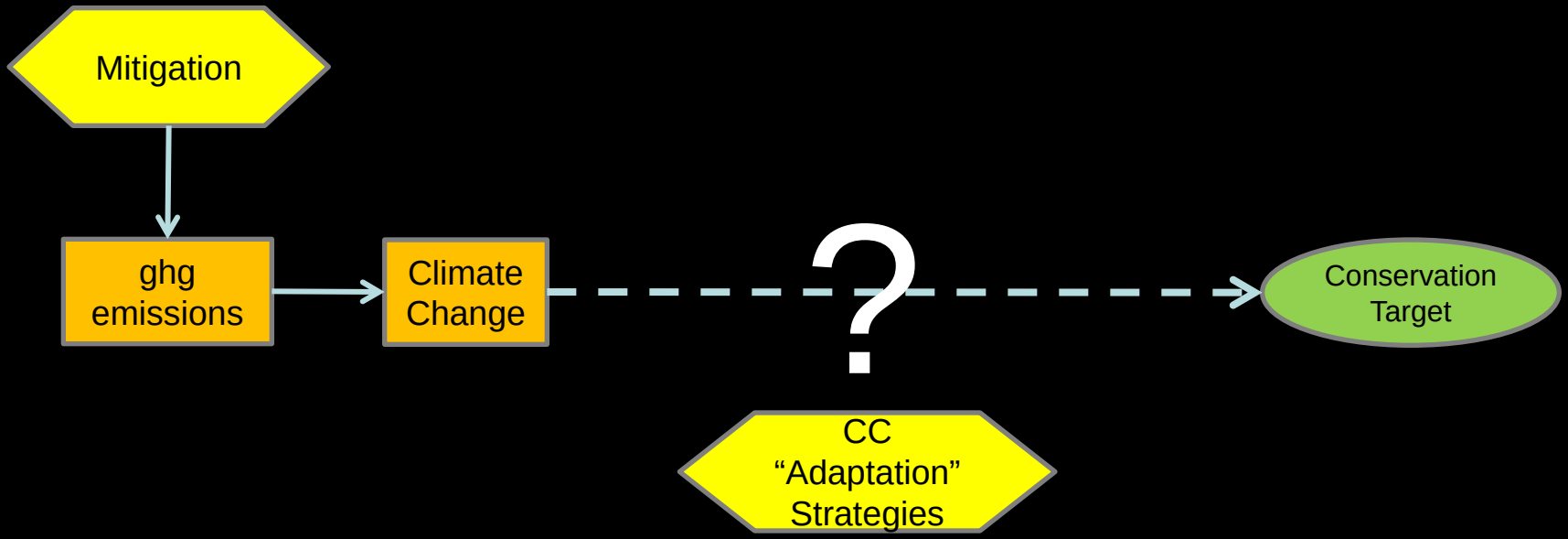
→ Describe the biological environment and systems that affect a conservation target



Source: USFWS



Source: CMP



Strategies taken to ameliorate actual or expected impacts of climate change

?? Tools/process to help identify the elements needed to develop these conceptual linkages

Vulnerability assessment

Key tool for understanding impacts of CC on species and habitats

Which species or systems are likely to be most affected?

What factors contribute to vulnerability?

Exposure

Sensitivity

Adaptive capacity

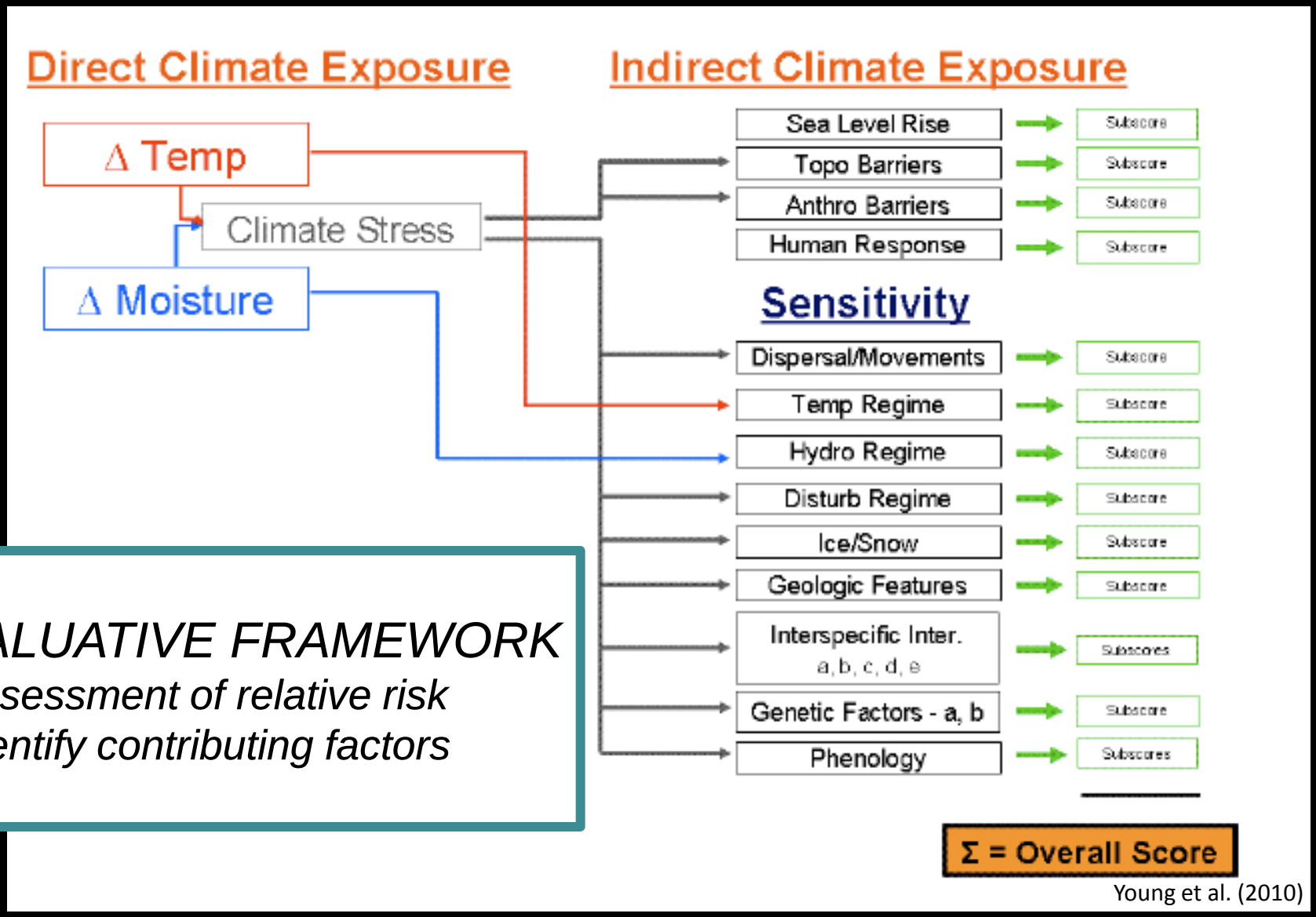
Not all species will respond in the same way

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

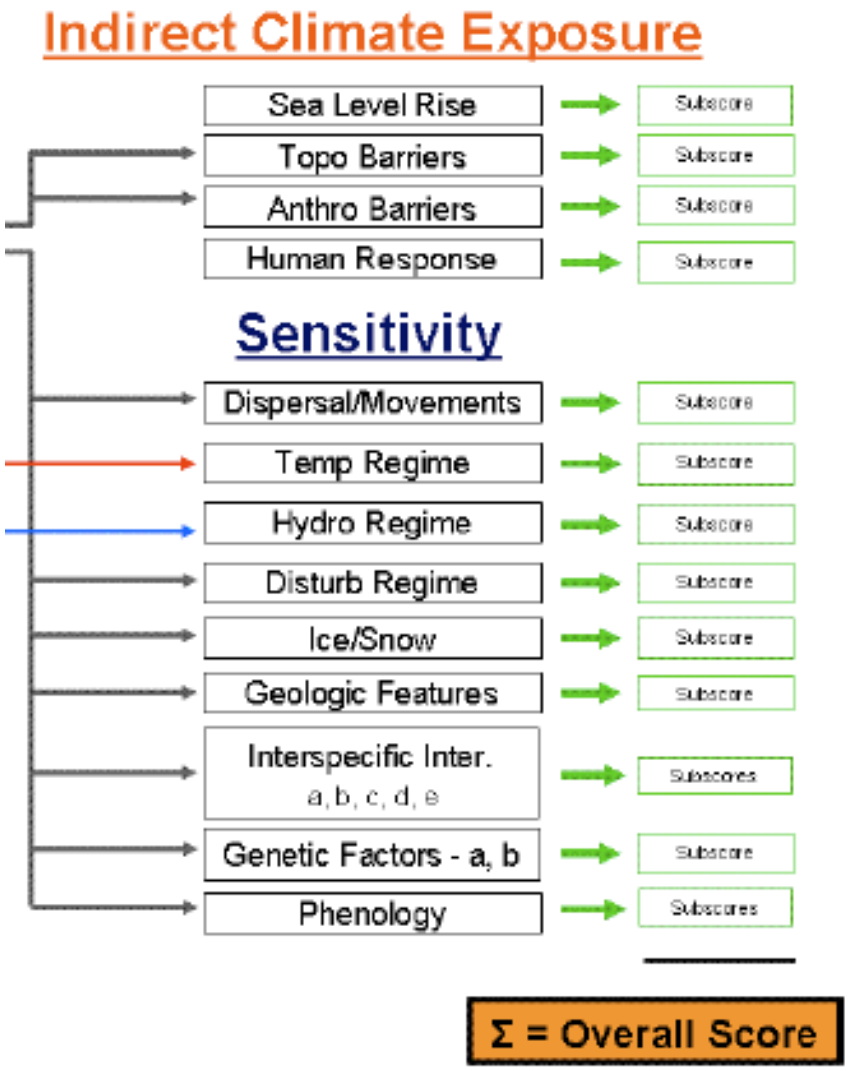
- *Assessment of relative risk*
- *Identify contributing factors*

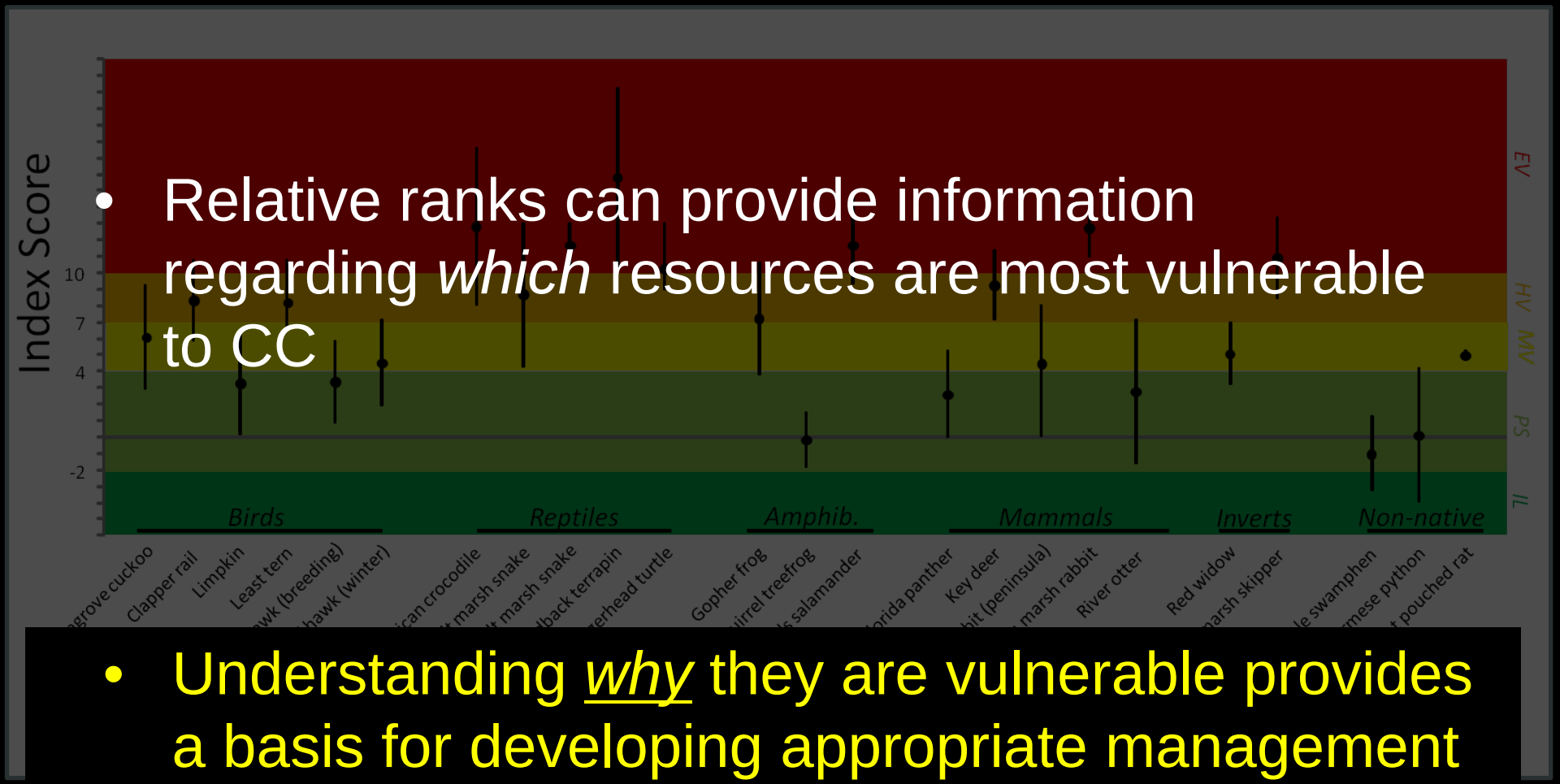
Young et al. (2010)

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

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							•





- 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

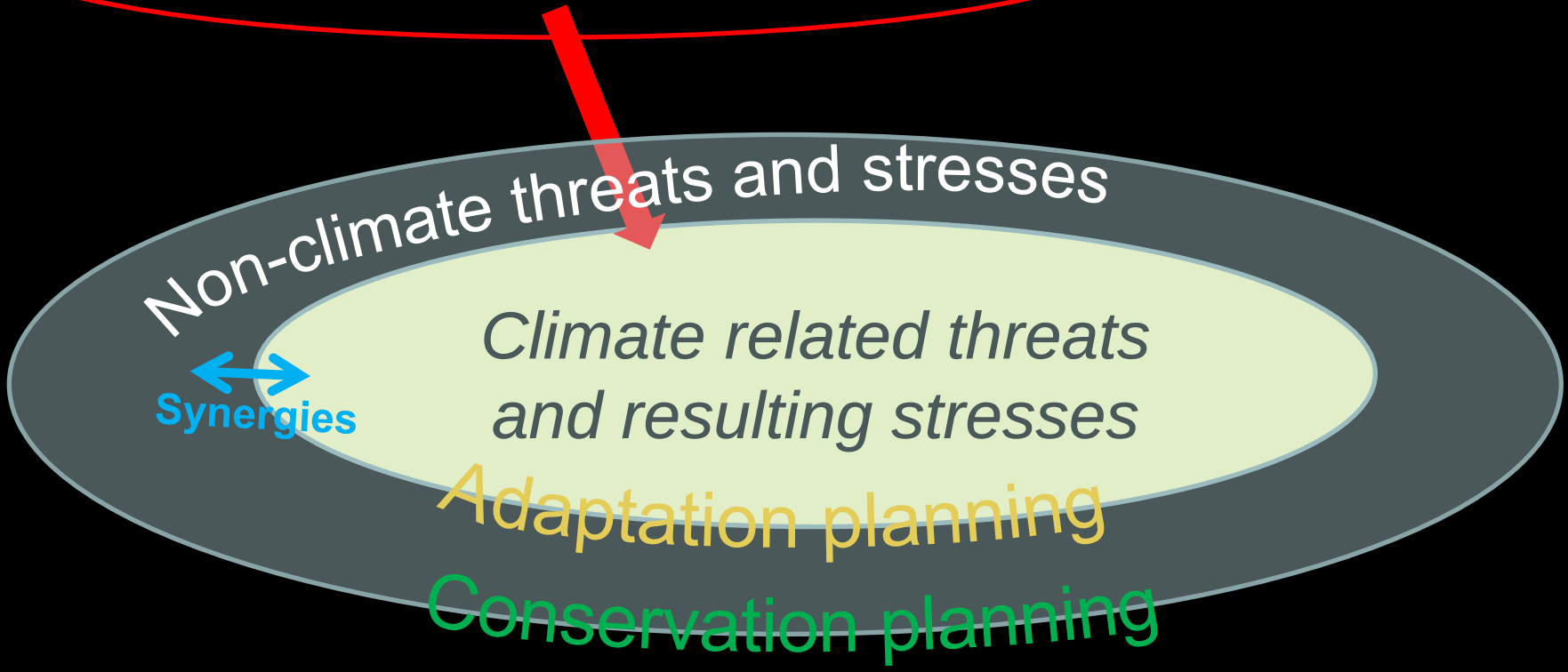
→ Informs threat assessment and feeds into conservation planning framework

Vulnerability assessment

Key tool for understanding impacts of CC on species and habitats

Which species or systems are likely to be most affected?

What factors contribute to vulnerability?



Vulnerability Assessment	Threat Assessment
Exposure	Drivers that generate new threats or exacerbate existing threats
Sensitivity	Attributes of the target that are sensitive to climate-related stresses
Adaptive capacity	Attributes of the target that reduce the impact of climate-related stresses

Climate Change Adaptation

- As part of a conservation planning process adaptation involves
  - Recognizing new threats
  - Identify interactions with existing threats
  - Re-evaluating existing strategies and priorities

- Adaptation strategies reduce threats that exist or take on additional relevance because of climate change

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

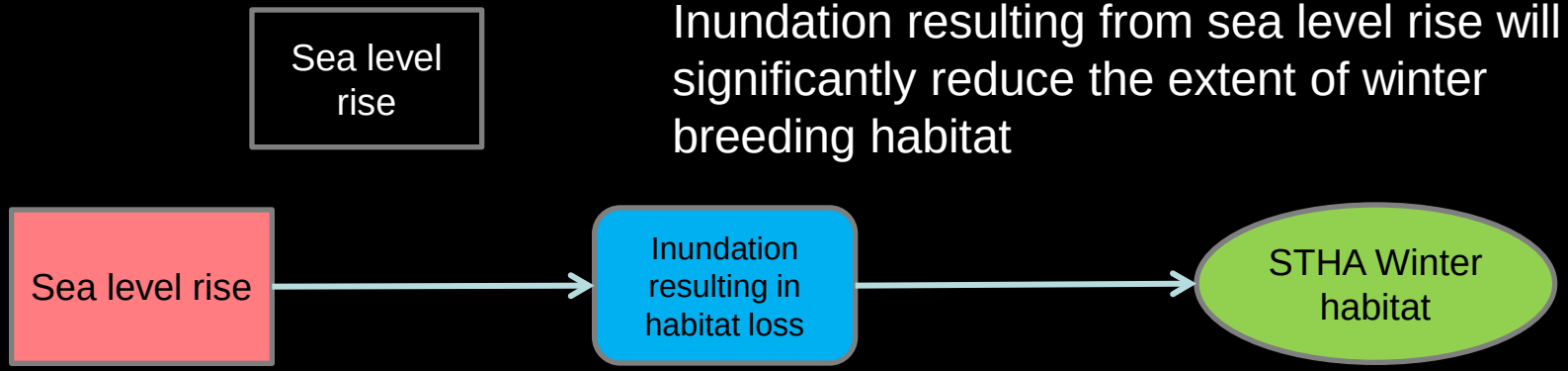
Short-tailed hawk (MV)
winter range

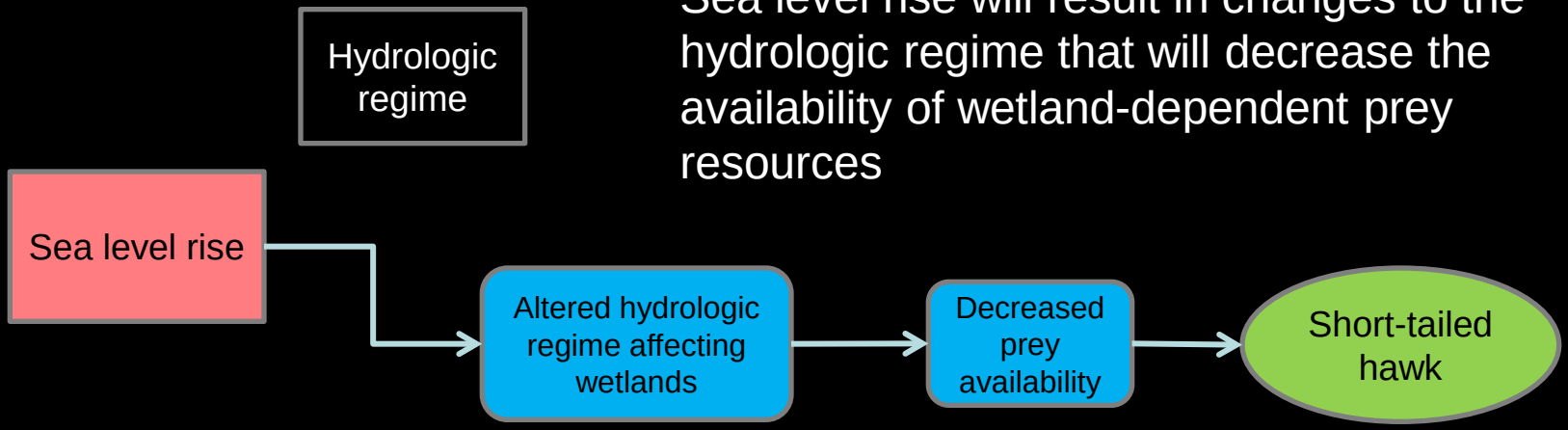
Sea level rise

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							•

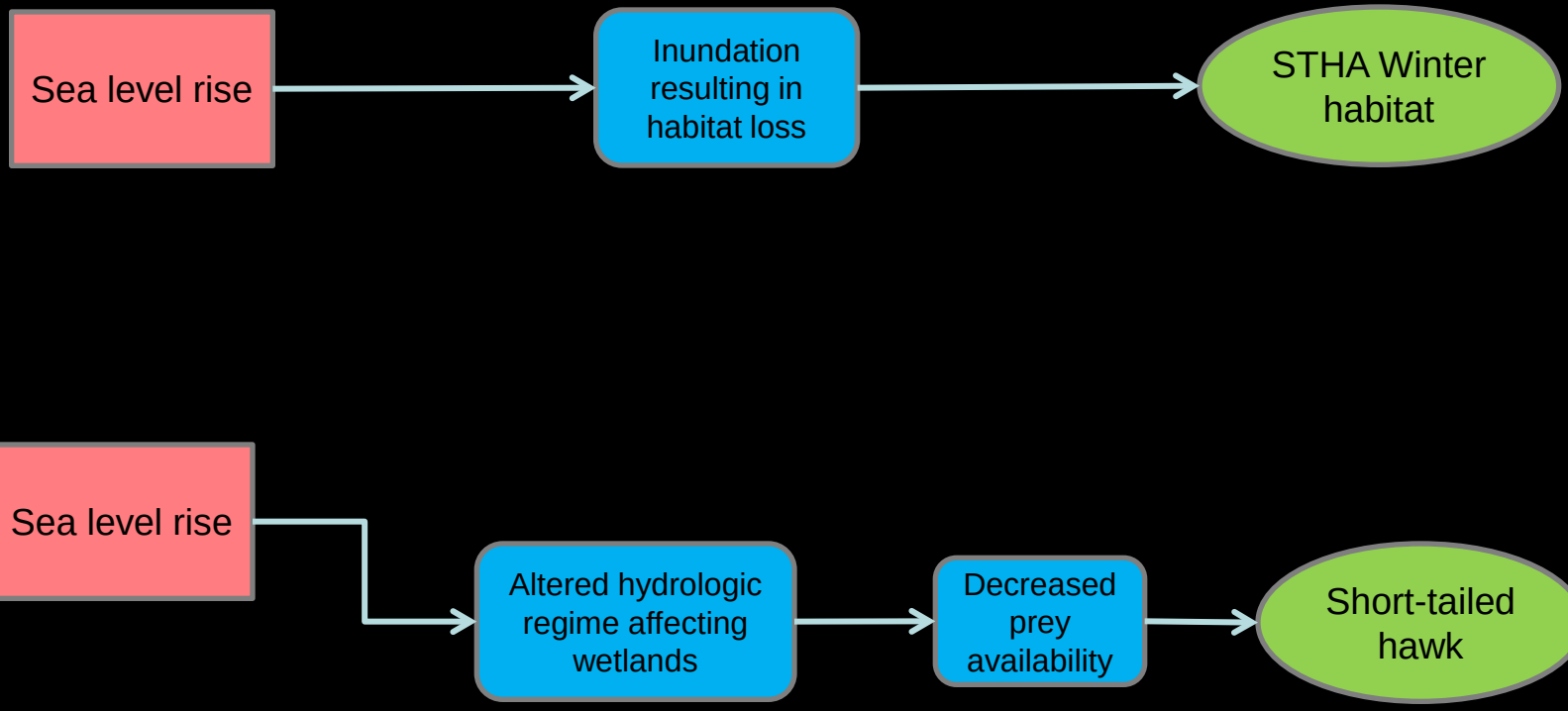
> Elucidate “hypotheses of change” (TNC 2009)





> Distinguish among sources of uncertainty

Likelihood of climate impact
Magnitude of climate impact
Habitat response
Species response

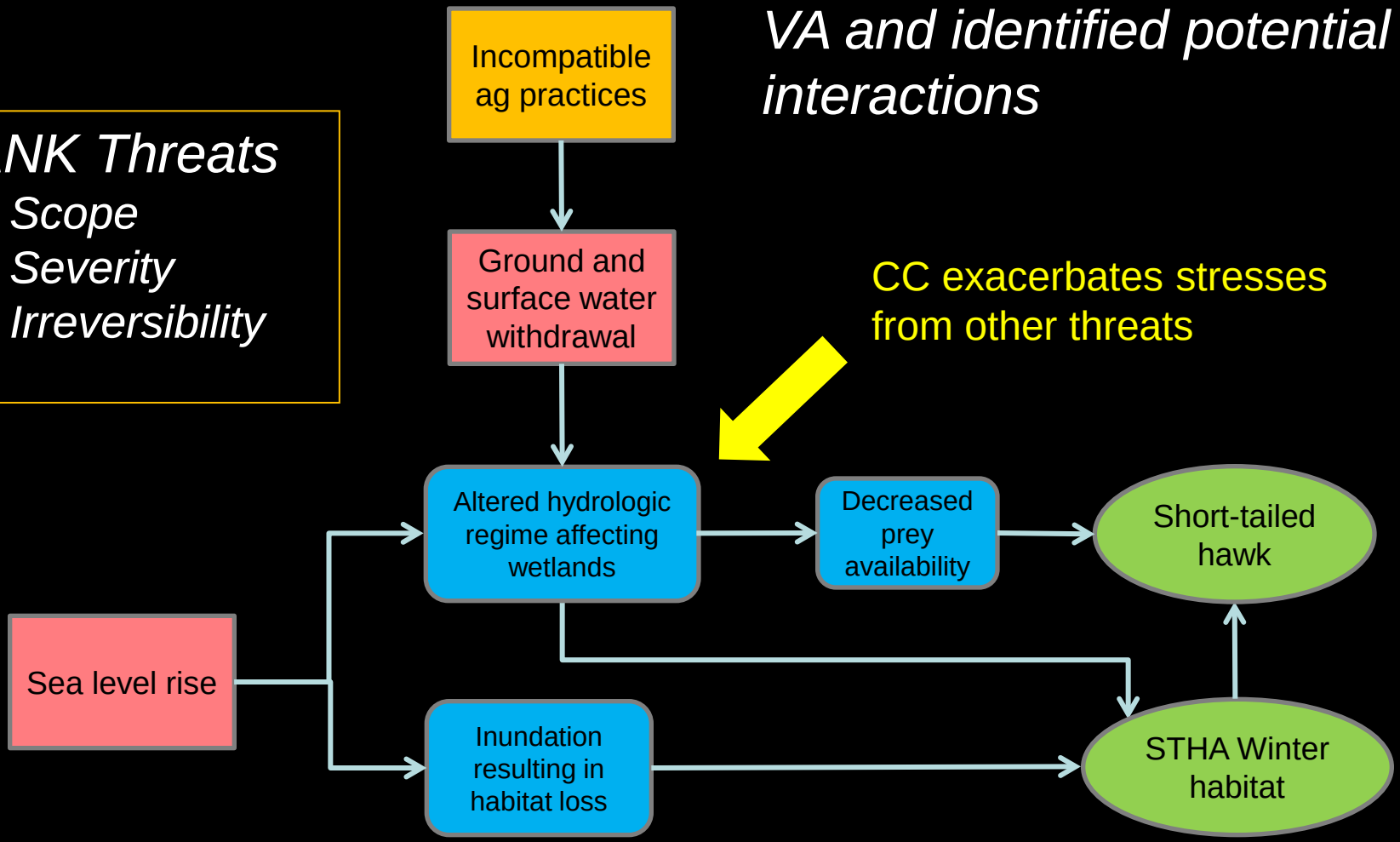


> Integrate into planning framework

Started with existing threats and stresses

Brought in elements from VA and identified potential interactions

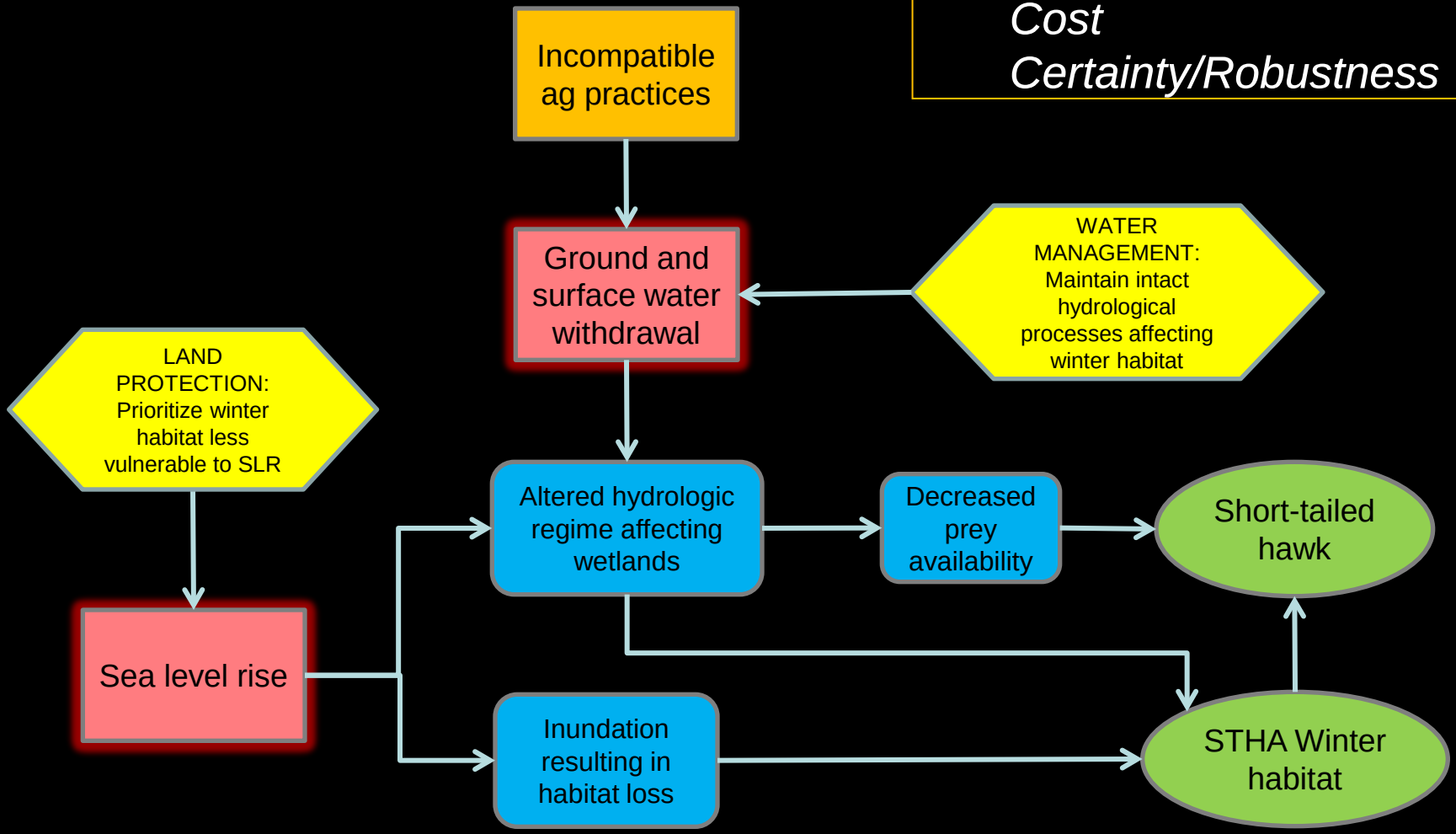
RANK Threats
- *Scope*
- *Severity*
- *Irreversibility*

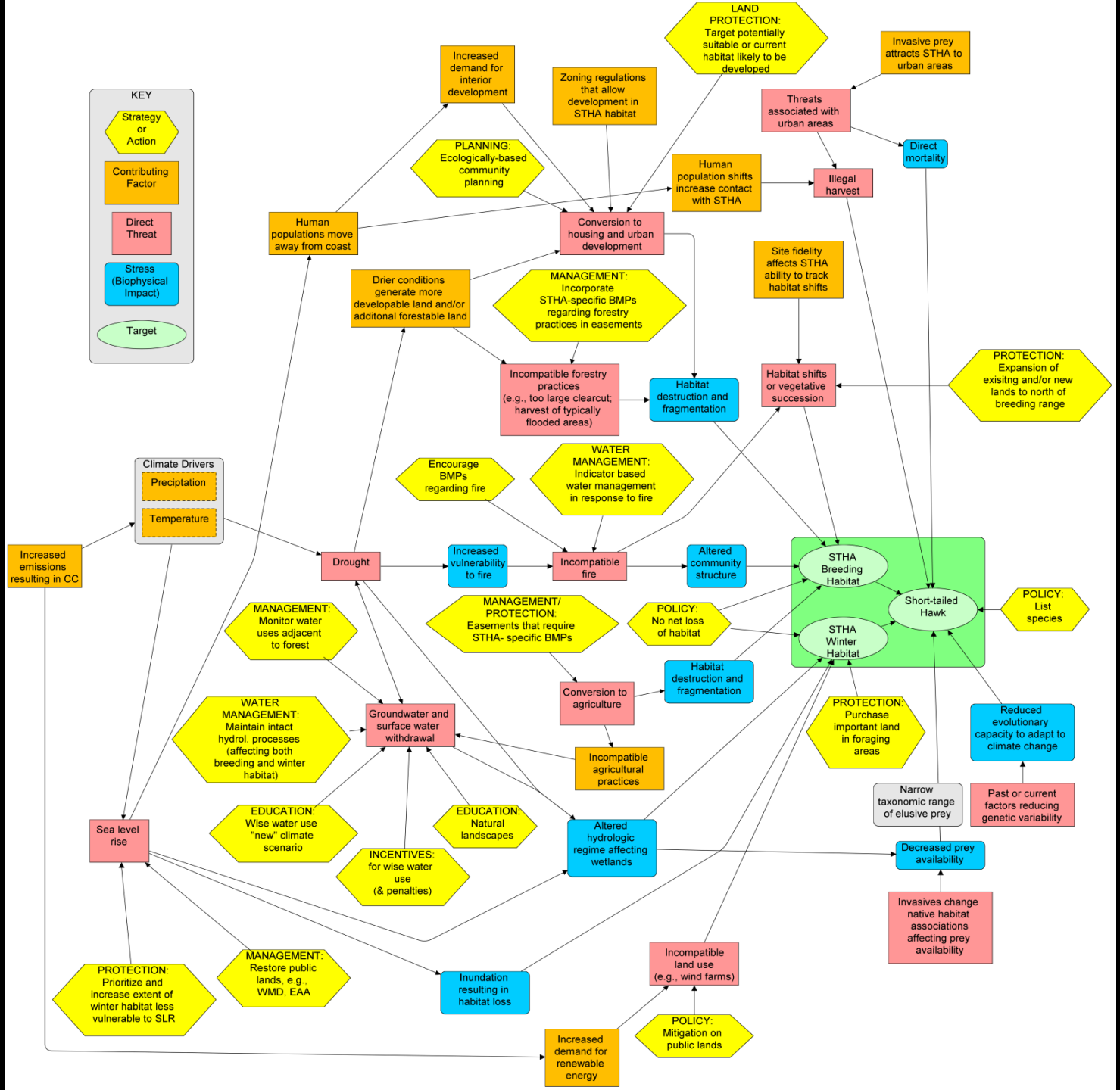


Identify intervention points and actions

RANK Strategies

- *Benefit*
- *Feasibility*
- *Cost*
- *Certainty/Robustness*




KEY
Strategy or Action
Contributing Factor
Direct Threat
Stress (Biophysical Impact)
Target
LAND PROTECTION: Target potentially suitable or current habitat likely to be developed
Increased demand for interior development
Zoning regulations that allow development in STHA habitat
Invasive prey attracts STHA to urban areas
Threats associated with urban areas
Direct mortality
PLANNING: Ecologically-based community planning
Human population shifts increase contact with STHA
Illegal harvest
Human populations move away from coast
Conversion to housing and urban development
Site fidelity affects STHA ability to track habitat shifts
Drier conditions generate more developable land and/or additonal forestable land
MANAGEMENT: Incorporate STHA-specific BMPs regarding forestry practices in easements
Incompatible forestry practices (e.g., too large clearcut; harvest of typically flooded areas)
Habitat destruction and fragmentation
Habitat shifts or vegetative succession
PROTECTION: Expansion of exisitng and/or new lands to north of breeding range
Climate Drivers
Preciptation
Temperature
Encourage BMPs regarding fire
WATER MANAGEMENT: Indicator based water management in response to fire
Increased emissions resulting in CC
Drought
Increased vulnerability to fire
Incompatible fire
Altered community structure
STHA Breeding Habitat
STHA Winter Habitat
Short-tailed Hawk
POLICY: List species
MANAGEMENT: Monitor water uses adjacent to forest
MANAGEMENT/ PROTECTION: Easements that require STHA- specific BMPs
POLICY: No net loss of habitat
Habitat destruction and fragmentation
Conversion to agriculture
PROTECTION: Purchase important land in foraging areas
Reduced evolutionary capacity to adapt to climate change
WATER MANAGEMENT: Maintain intact hydrol. processes (affecting both breeding and winter habitat)
Groundwater and surface water withdrawal
Incompatible agricultural practices
Narrow taxonomic range of elusive prey
Past or current factors reducing genetic variability
EDUCATION: Wise water use "new" climate scenario
EDUCATION: Natural landscapes
Sea level rise
Altered hydrologic regime affecting wetlands
Decreased prey availability
INCENTIVES: for wise water use (& penalties)
Invasives change native habitat associations affecting prey availability
PROTECTION: Prioritize and increase extent of winter habitat less vulnerable to SLR
MANAGEMENT: Restore public lands, e.g., WMD, EAA
Inundation resulting in habitat loss
Incompatible land use (e.g., wind farms)
POLICY: Mitigation on public lands
Increased demand for renewable energy

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

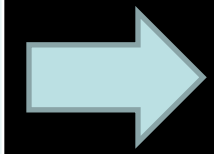
Table 3. Workshop participants used the conceptual models to identify a set of priority strategies addressing climate-related threats for each focal species. Where spatially-explicit actions could be identified, these were integrated into the Alternative Futures approach and mapped on the landscape (see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

	Potential priority strategies
Short-tailed hawk	PLANNING: Ecologically-based community planning (targets breeding habitat) LAND PROTECTION: Targeting potential or current habitat likely to be developed (breeding habitat) MANAGEMENT: Restore public lands and protected private land in WMD and EAA (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 (breeding habitat)
Least tern	MANAGEMENT: Develop best management practices for beach management (e.g. beach raking, natural shorelines) LAND PROTECTION: Maintain natural storm buffers by protecting coastal land through fee-simple or easement acquisition PLANNING: Draft model building codes for keeping gravel roofs as nesting habitat MANAGEMENT: Restrict use (e.g. mark off) beach during nesting season
Atlantic Salt marsh snake	MANAGEMENT: Restoration of habitat using dredge soils LAND PROTECTION: Protect corridors for inland migration of salt marsh via fee simple or easements acquisition. RESEARCH: Model vegetation succession with downscaled sea level rise models POLICY: Rezone low elevation areas
American crocodile	RESEARCH: Increase understanding of how mangroves will shift and appropriate vegetation management responses MONITORING: Changes to population size, trends and habitat MANAGEMENT: Create nesting/nursery habitat if needed (as indicated by monitoring) POLICY: Ensure water management in Everglades is consistent with crocodile management (impacts to salinity) 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 LAND PROTECTION: Secure travel/habitat corridors via fee simple or easements acquisition, especially for crossing over to areas north of the Caloosahatchee River. 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 MANAGEMENT: Fill/remove mosquito ditches LAND PROTECTION: Fee-simple or easement acquisition, including road underpasses RESEARCH: Disease/disease management MANAGEMENT: Implement appropriate fire regime

Integrating approaches

what?

Strategy
LAND PROTECTION: Prioritize and increase extent of winter habitat in areas less vulnerable to SLR



where?

Integrated into MIT's Alternative Futures scenarios and mapped on landscape

Massachusetts Institute of Technology

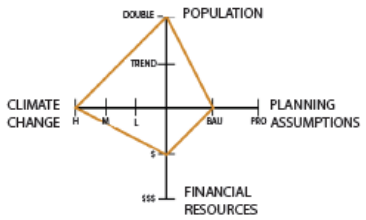
Michael Flaxman
Juan Carlos Vargas Moreno
Dept of Urban Studies and Planning

"Alternative Futures"

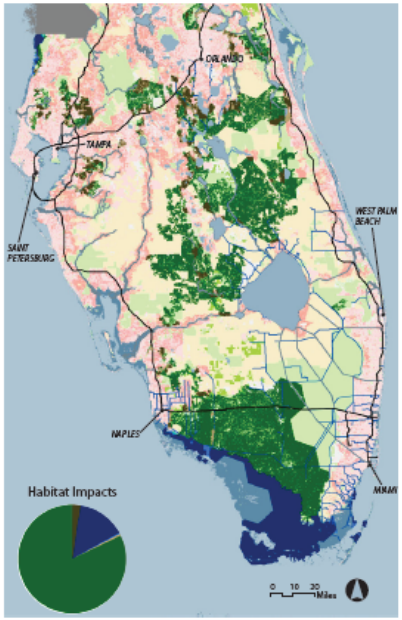
- Future land use scenarios incorporate climate change (SLR), public policy options and financial conditions
- Examine conflict between current habitat and future conditions
- Provide spatial context in which to translate adaptation strategies into spatially-explicit actions

http://www.alternativefuturestechnologies.com/everglades

Scenario C

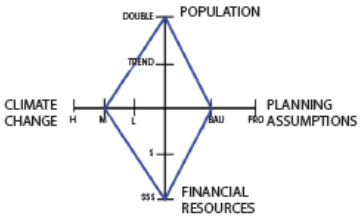


Land Use / Land Cover 2060

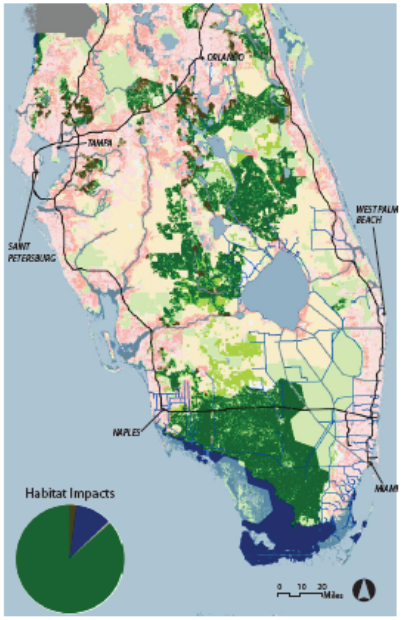


Habitat Impacts By Land Use Type	2060 %	2060 Acres
Agriculture to Inundated	0.03%	1,150
Agriculture to Urban	2.40%	93,314
Conservation to Inundated	14.55%	566,206
Other to Inundated	0.26%	9,996
Other to Urban	0.66%	25,855
No Habitat Conflict	82.10%	3,194,515
Total Habitat Conflict	17.90%	696,521

Scenario E



Land Use / Land Cover 2060



Habitat Impacts By Land Use Type	2060 %	2060 Acres
Agriculture to Inundated	0.00%	5
Agriculture to Urban	2.12%	82,668
Conservation to Inundated	10.70%	416,301
Other to Inundated	0.14%	5,586
Other to Urban	0.60%	23,308
No Habitat Conflict	86.43%	3,363,168
Total Habitat Conflict	13.57%	527,867

Synthesis

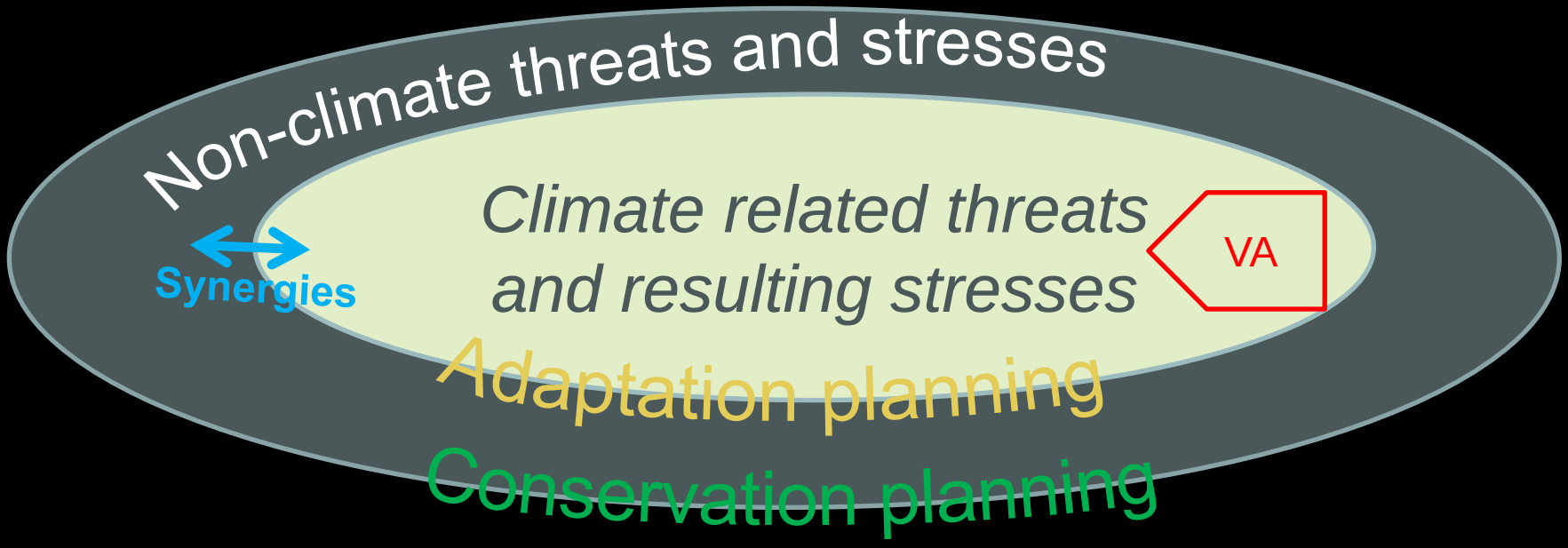
1. Developing effective adaptation strategies requires understanding the conceptual linkages connecting climate threats to the stresses affecting a conservation target

Synthesis

2. Vulnerability assessments can provide an evaluative framework to help elucidate these linkages and identify sources of uncertainty

Synthesis

3. Vulnerability assessments provide a foundation for integrating adaptation planning into existing planning frameworks



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