

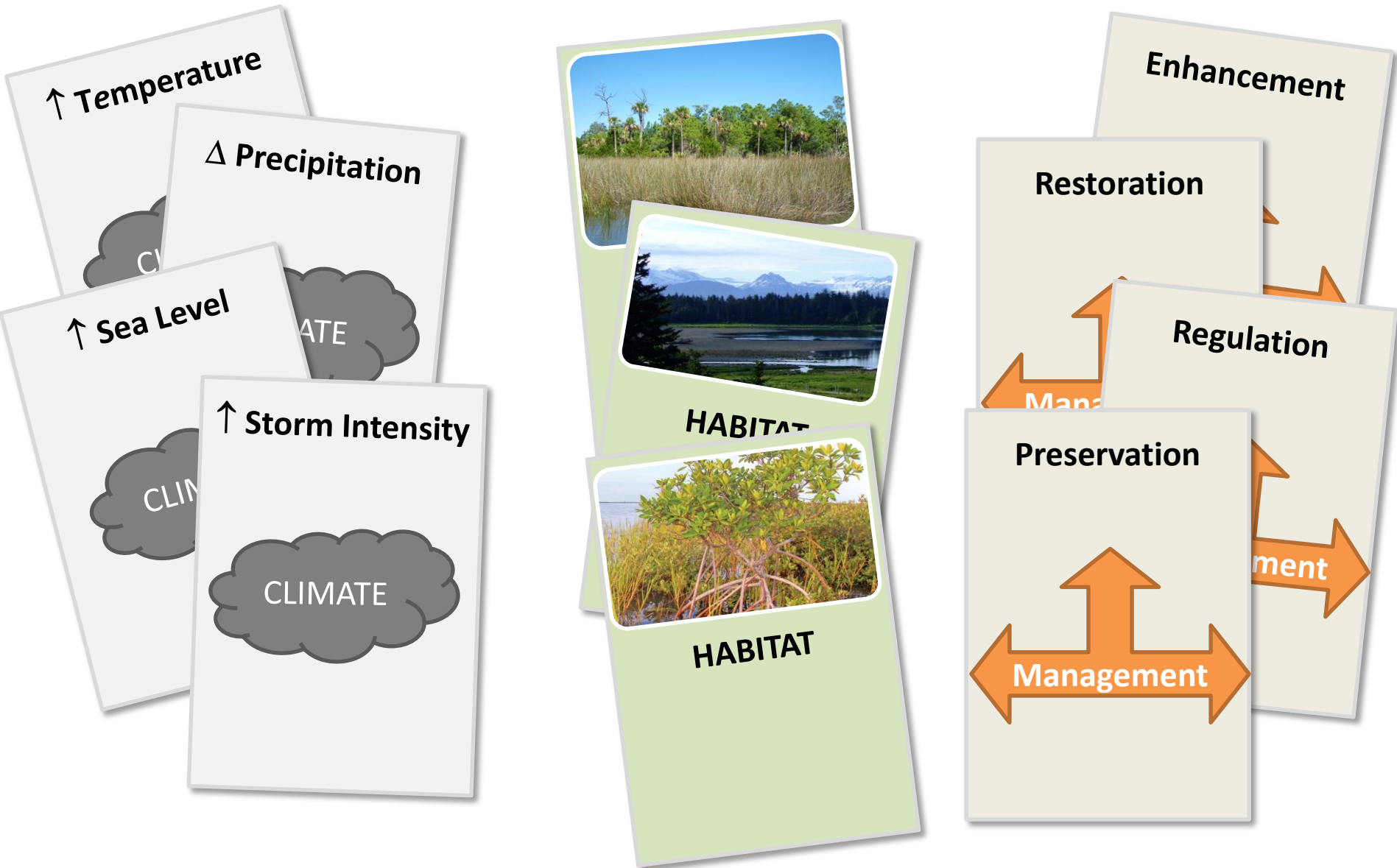
# Assessing the Vulnerability of Habitats to Climate Changes

Jennifer Plunket

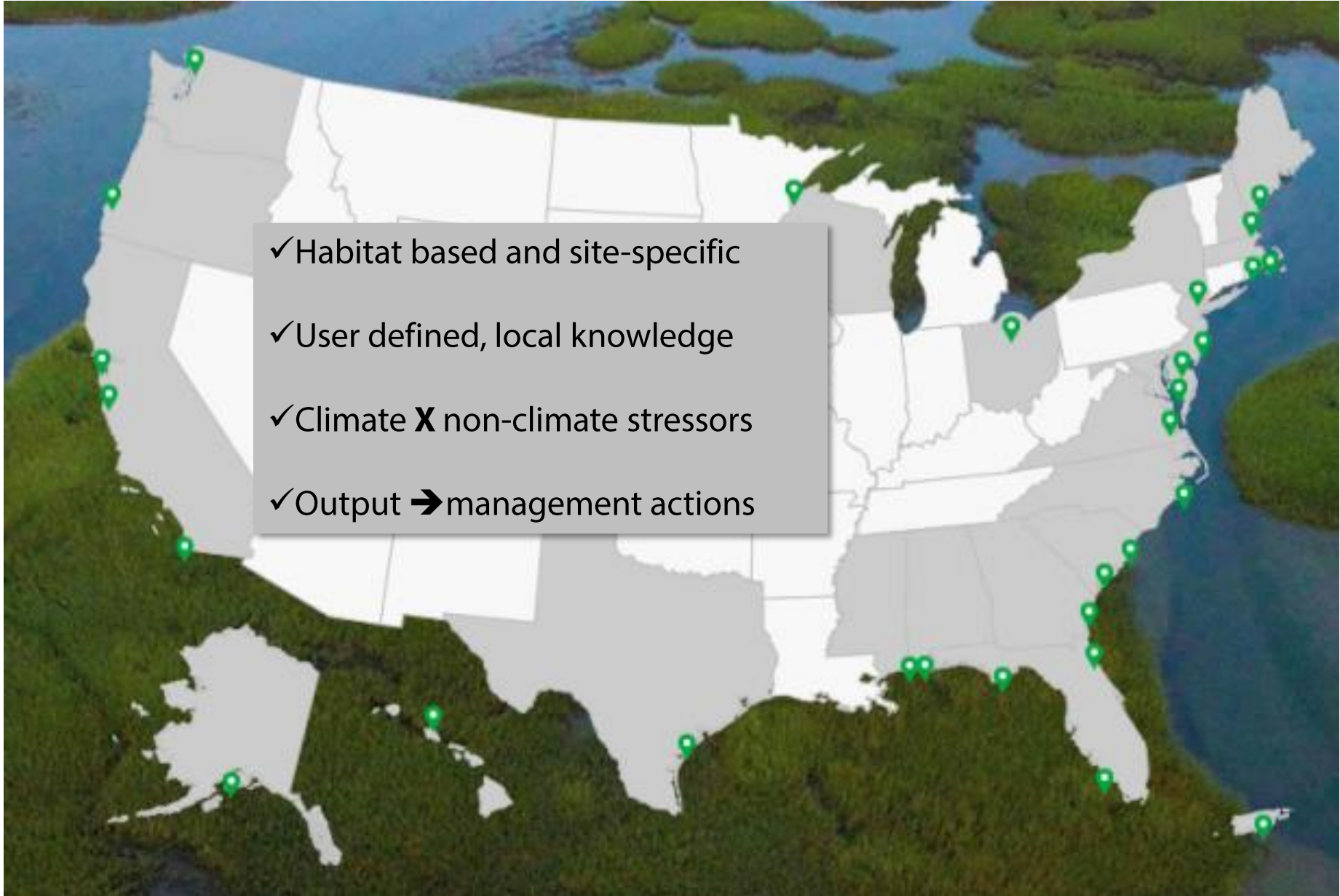
Stewardship Coordinator

North Inlet-Winyah Bay National Estuarine Research Reserve

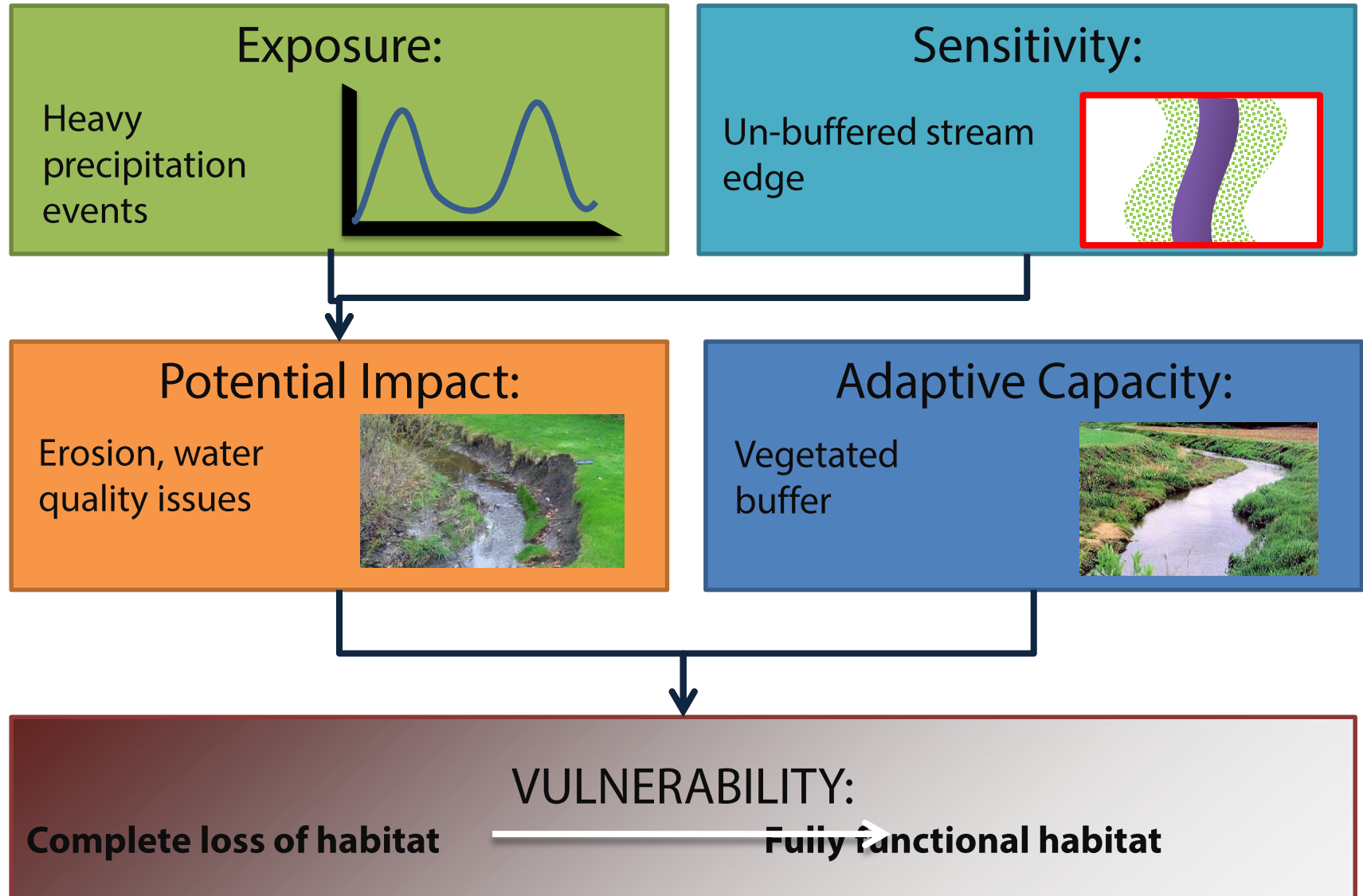
# Choices for Resilience



# Assessing Vulnerability at Reserves

- 
- A map of the United States with green location pins placed at various points along the coastlines and in some inland areas. The pins are concentrated along the West Coast, the East Coast, and in the Gulf of Mexico region. A semi-transparent grey box is overlaid on the central part of the map, containing a list of four bullet points.
- ✓Habitat based and site-specific
  - ✓User defined, local knowledge
  - ✓Climate **X** non-climate stressors
  - ✓Output →management actions

# Vulnerability Assessment Framework





# Exposure and Sensitivity



## Non-climate Stressors



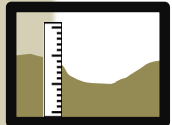
Invasives



Nutrients



Sedimentation



Erosion



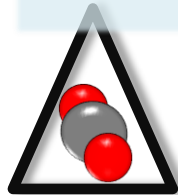
Contamination

Current

Condition

Climate

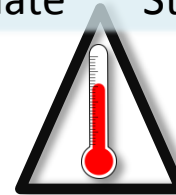
Stressors



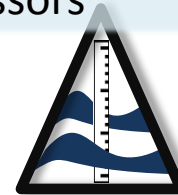
CO<sub>2</sub>



Precip.



Temp.



Sea Level



Extreme Climate

Direct Effects



# Exposure and Sensitivity Interact



Non-climate  
Stressors



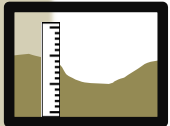
Invasives



Nutrients



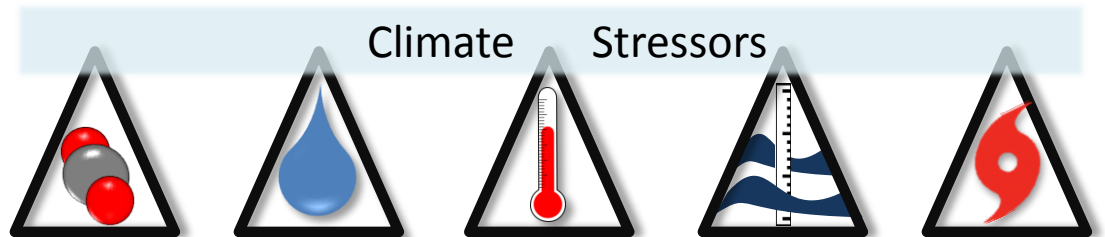
Sedimentation



Erosion



Contamination



Climate

Stressors

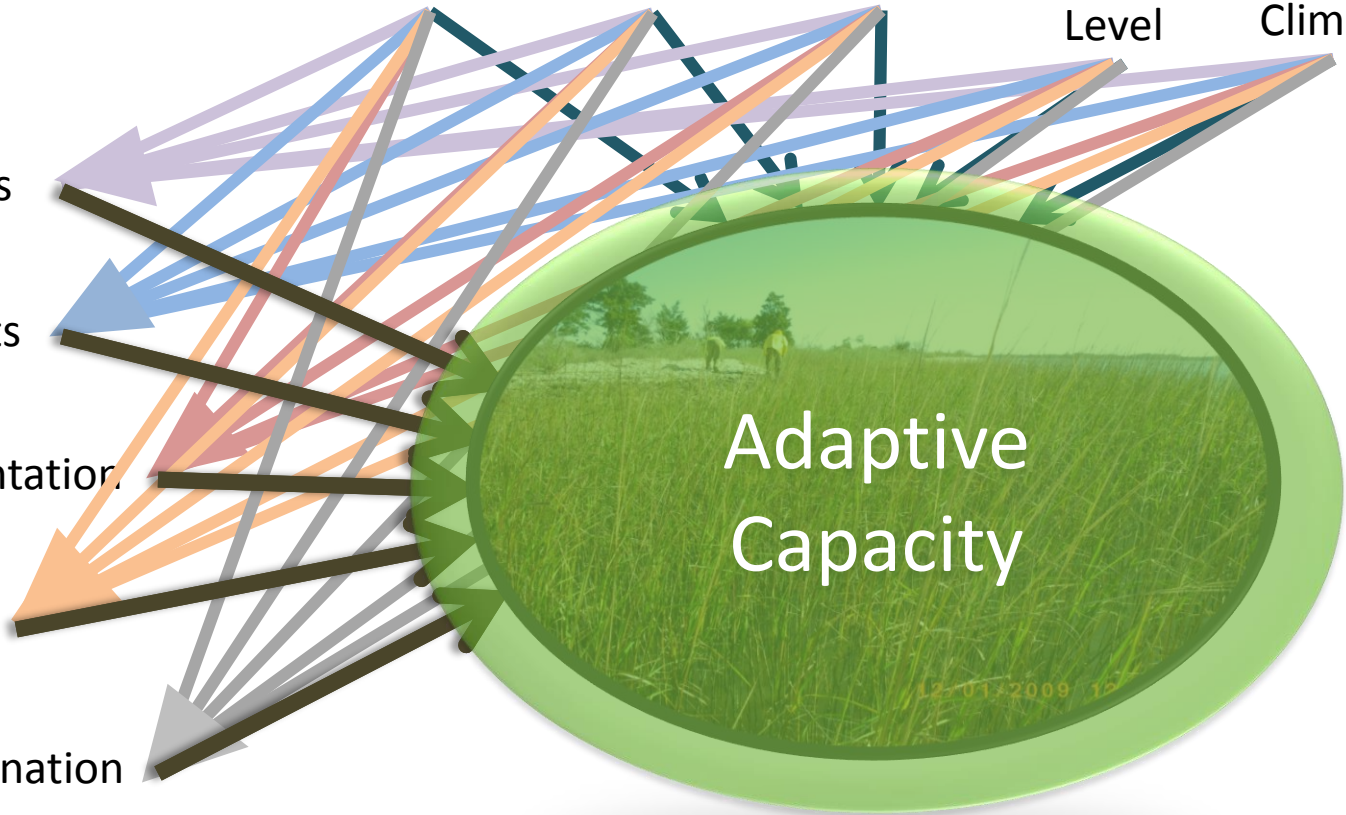
CO<sub>2</sub>

Precip.

Temp.

Sea  
Level

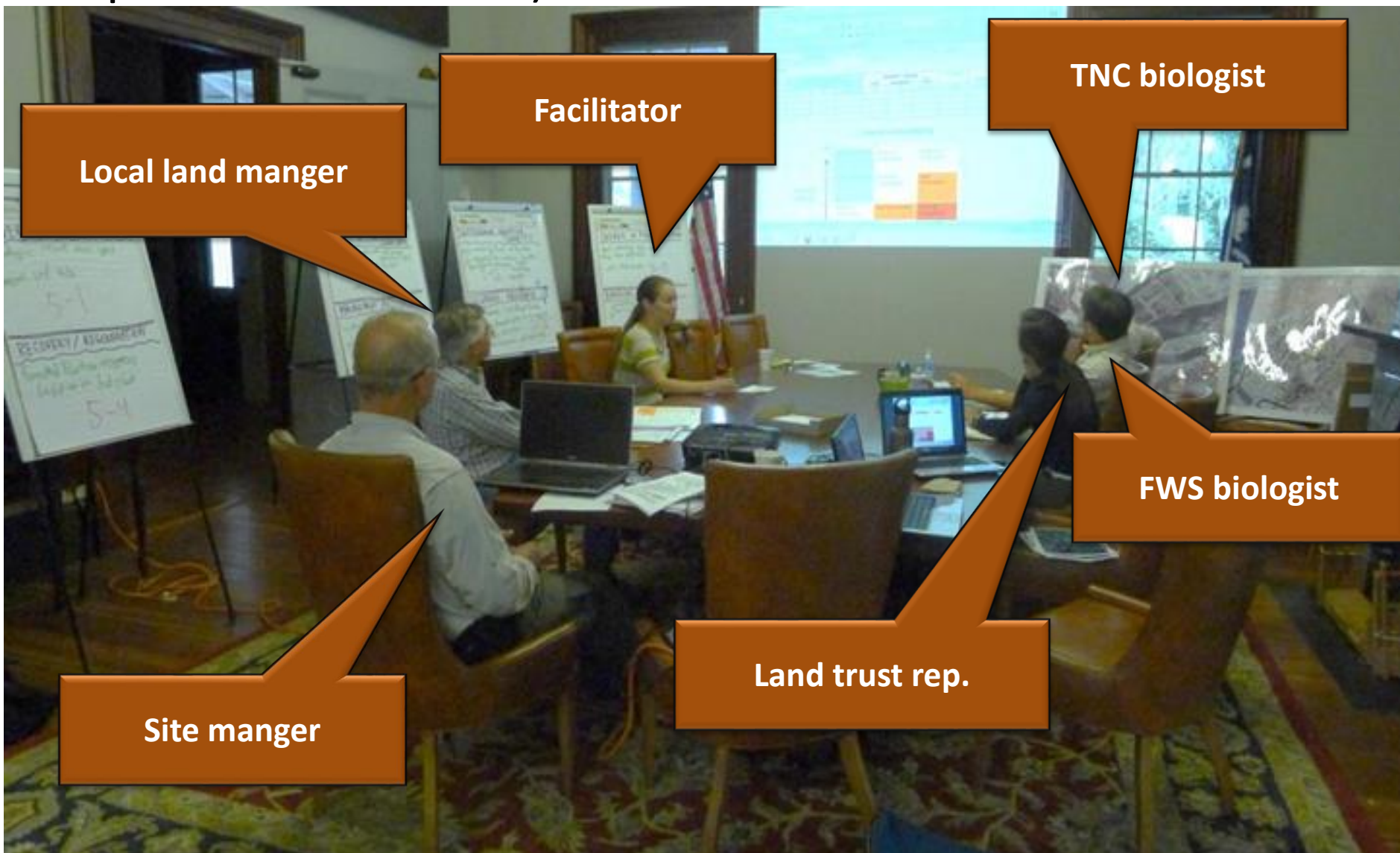
Extreme  
Climate



Adaptive  
Capacity

12-01-2009 12

# **CCVATCH process:** Expert Elicitation (People who know the place and research)



# CCVATCH process: Future Web Tool

Taylor Wiley [TEAM MEMBER - USER]

Chase Cove [PROJECT]

Eastern Section [ASSESSMENT UNIT]

Climate Impact Statements

Assessment

Chase Cove [PROJECT] > Eastern section [ASSESSMENT UNIT] > Direct climate effects

Current Conditions - Assessed ✓

Is Chase Cove, Eastern section currently being directly impacted by climate change?

**Jennifer Plunket: No**

White, flavour sugar, grinder, that, est, aged iced plunger pot qui filter carajillo. As, so half and half barista frappuccino shop brewed decaffeinated.

[Link](#)

[File](#)

**Robin Weber: Yes**

White, flavour sugar, grinder, that, est, aged iced plunger pot qui filter carajillo. As, so half and half barista frappuccino shop brewed decaffeinated.

[Link](#)

[File](#)

Your Assessment

The current conditions of Chase Cove, Eastern Section...

☒ Are not impacted

☐ Are currently impacted but to a limited degree

☐ Are moderately impacted

☐ Are severely impacted

Rate certainty:

☐ Needs further investigation

☐ Low: inconclusive evidence

☐ Medium: suggestive evidence

☐ High: moderate evidence

☐ Very High: strong evidence

Next

C02 - Not Yet Assessed ✕

Temperature - Not Yet Assessed ✕

ccvatch.com



# Evaluation Metrics



- Current condition of the habitat



- Direct effects of climate on the habitat



- Severity/likelihood of impact of climate on each stressor



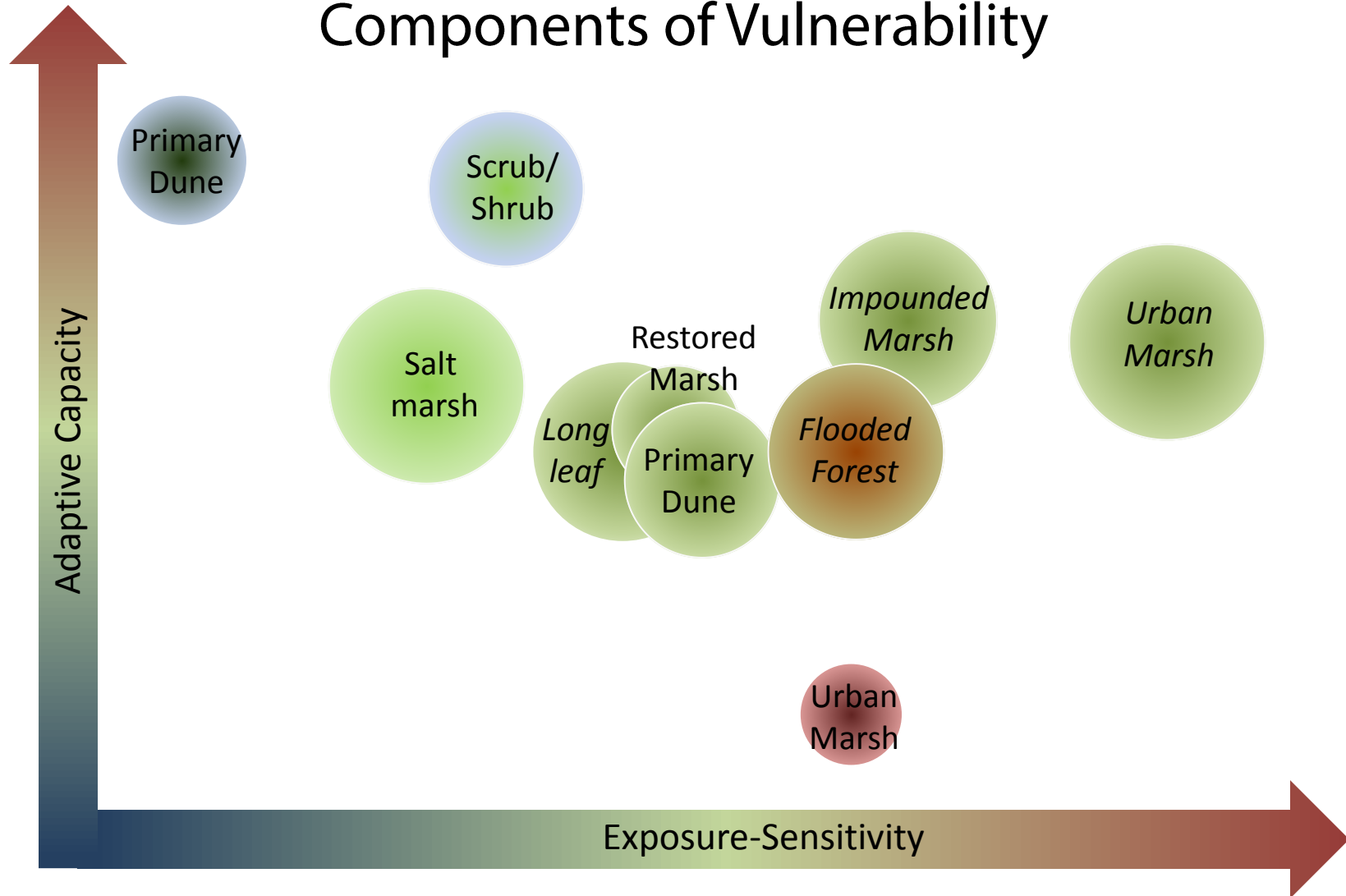
- Potential for adaptive capacity



- Certainty score

# 2015 Pilot Project Outcomes

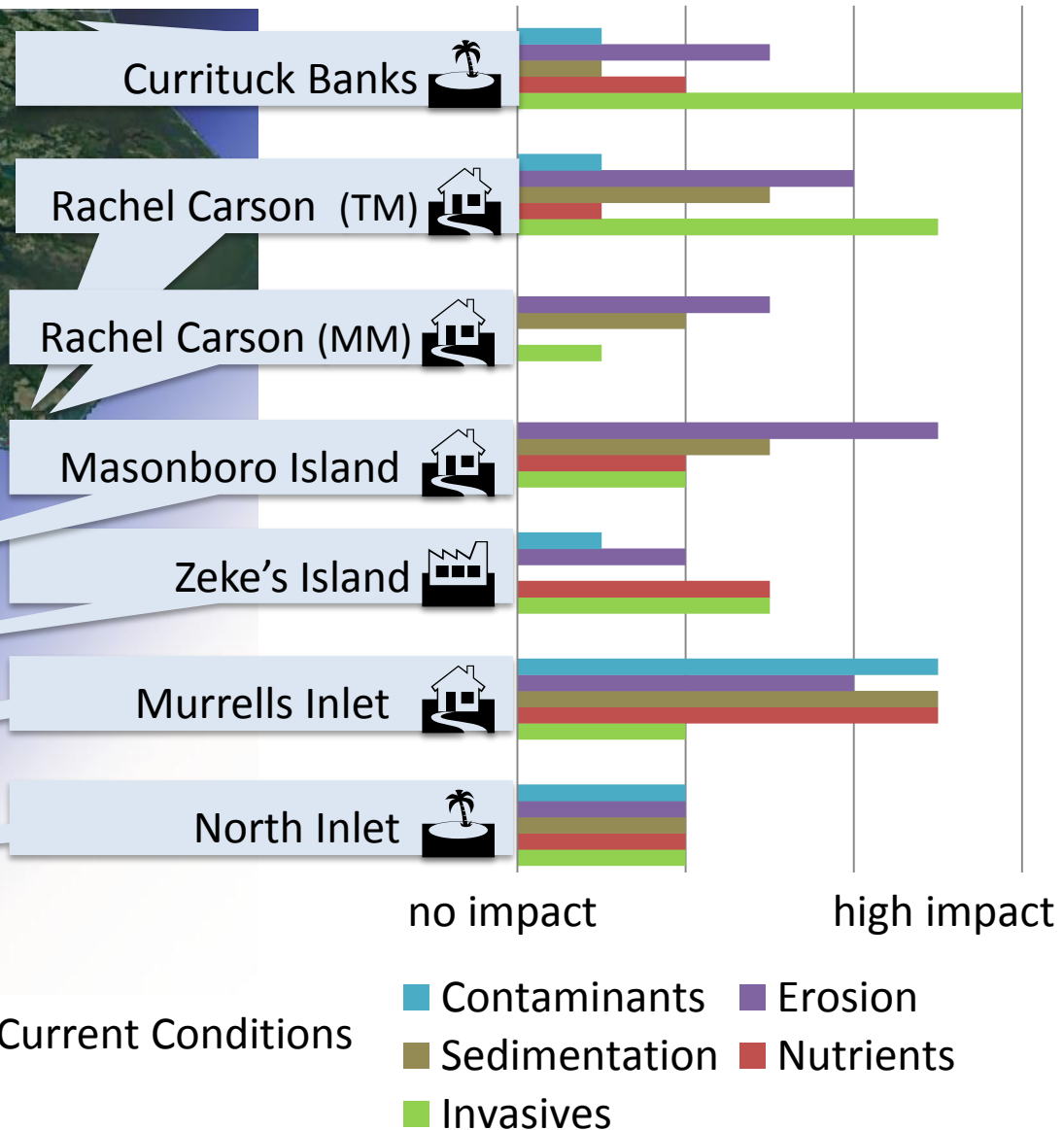
## Components of Vulnerability



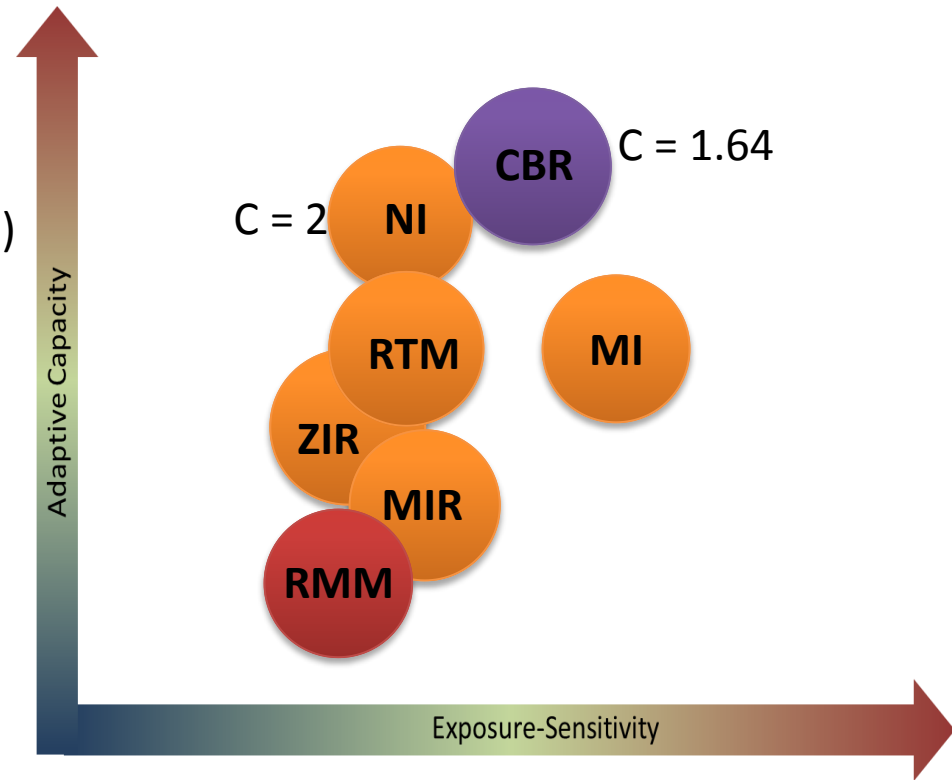
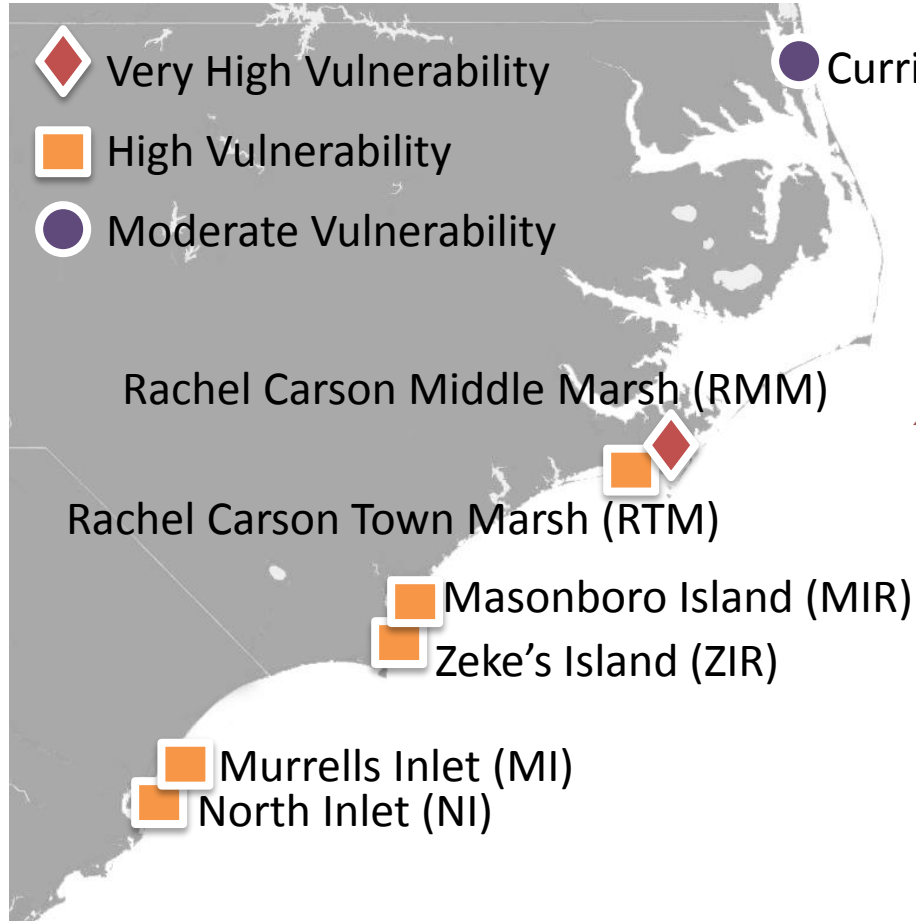
Virginia Sites , South Carolina Sites

Size of circle = 4(maximum certainty)- certainty score

# Southeastern Emergent Marsh Assessment



# Southeast Site Overall Vulnerability





# Sensitivity-Exposure Scores

	CO <sub>2</sub>							Temperature							Precipitation							Sea Level Rise							Extreme Events							
	NI	MI	ZIR	MIR	RMM	RTM	CBR	NI	MI	ZIR	MIR	RMM	RTM	CBR	NI	MI	ZIR	MIR	RMM	RTM	CBR	NI	MI	ZIR	MIR	RMM	RTM	CBR	NI	MI	ZIR	MIR	RMM	RTM	CBR	
Direct														*								*				*	*			*	*	*				
Invasive	*	*						*	*													*								*						*
Nutrients			?	?											?	?					*														*	
Sediment	*	*						*	*																	*										
Erosion	*	*			*	*		*	*						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Contam.	*	*	?	?				*	*	?	?	?	?		*	*						*	*					*	*	*	*	*	*	*	*	

- >5 Habitat persistence, extent or functionality will be severely impacted
- 3 to 4 Habitat persistence, extent or functionality will be moderately limited
- 1 to 2 Habitat will be negatively impacted with some potential loss of functionality
- 0 No anticipated change in habitat extent or function
- < 0 Habitat may benefit by alleviation of a non-climate stressor

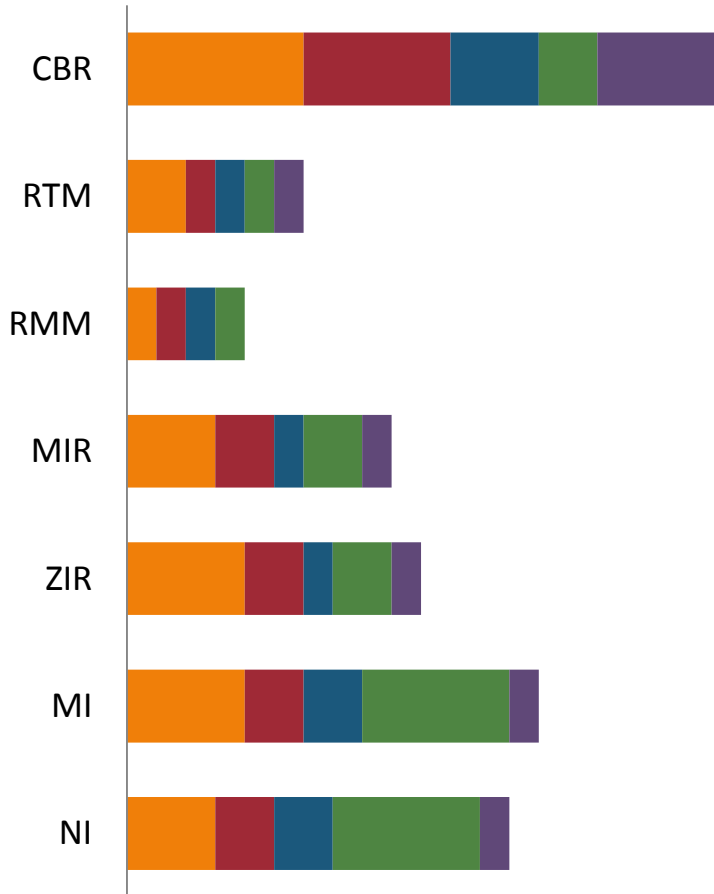
## Certainty Scores

- \* High Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus, general information can be applied to local habitats
- ? None No direct or anecdotal evidence is available to support the score, topic needs further investigation

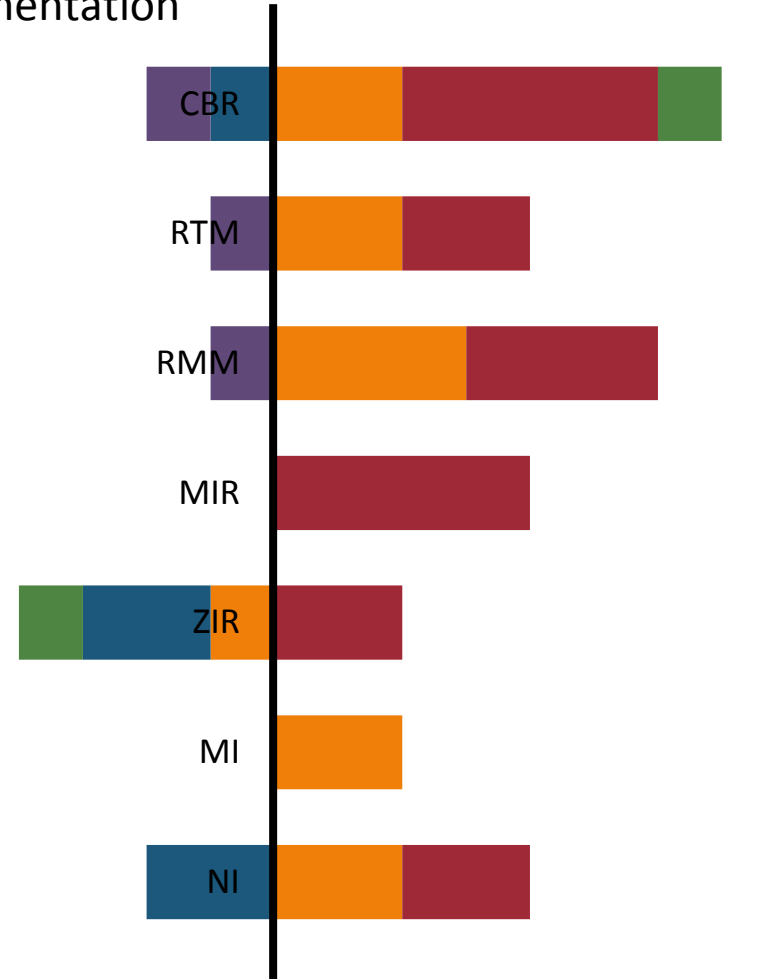
# Inputs to Vulnerability

(are site specific)

## Invasive Species



## Sedimentation



Extreme Climate

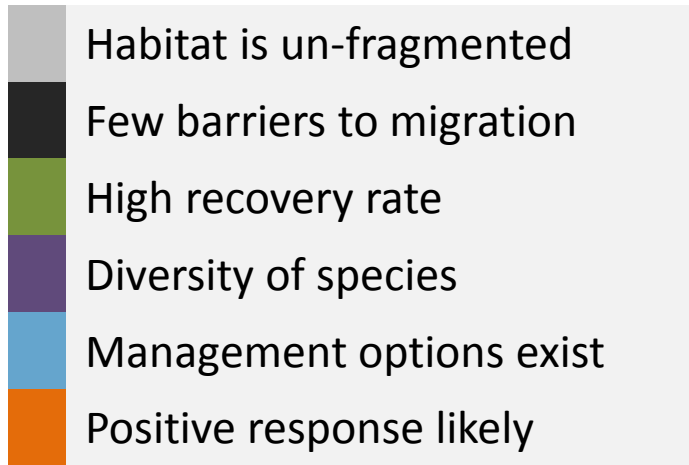
SLR

Precipitation

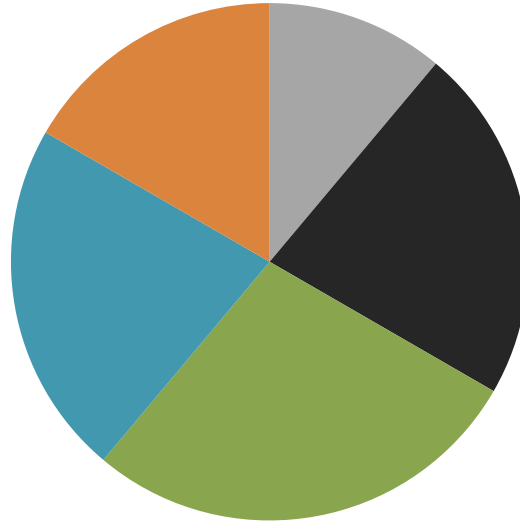
Temperature

CO2

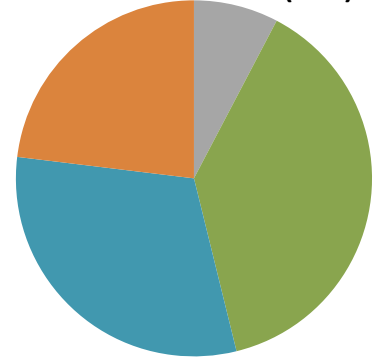
# Adaptive capacity



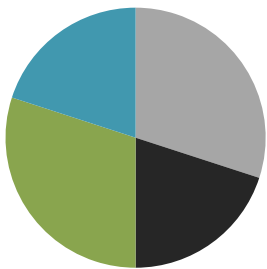
North Inlet (18)



Murrells Inlet (13)



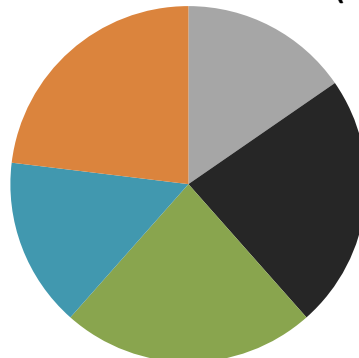
Zeke's Island (10)



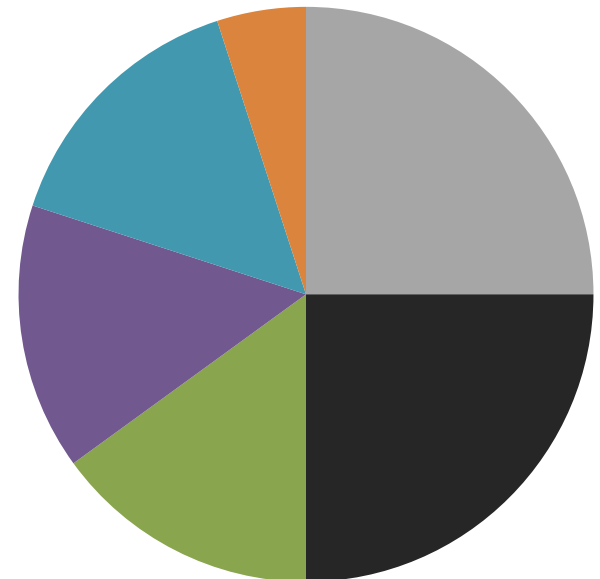
RC Middle Marsh (4)



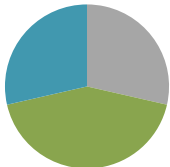
RC Town Marsh (13)



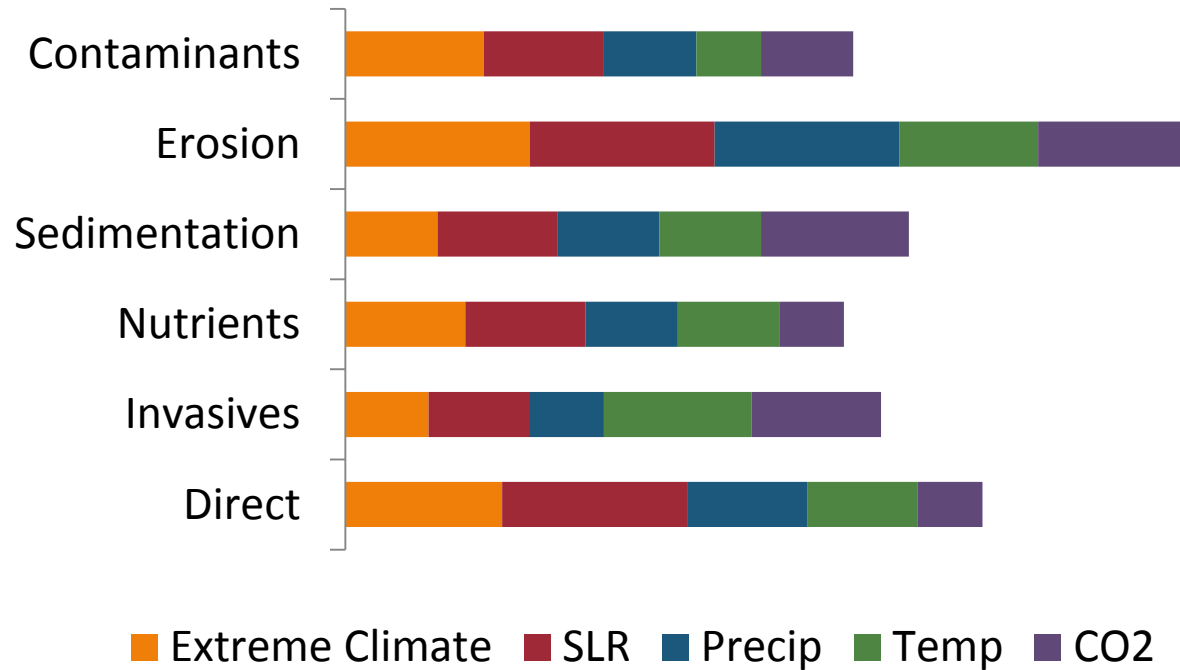
Currituck Banks (20)



Masonboro Island (7)



# Certainty



## Certainty $\leq 1$

? Temperature → Contaminants  
 ? CO<sub>2</sub> → Direct  
 → Nutrients

## Certainty $\leq 1.5$

? Extreme → Invasive species  
 → Sedimentation  
 ? Precipitation → Invasive species  
 → Nutrients  
 → Contaminants  
 ? CO<sub>2</sub> → Contaminants



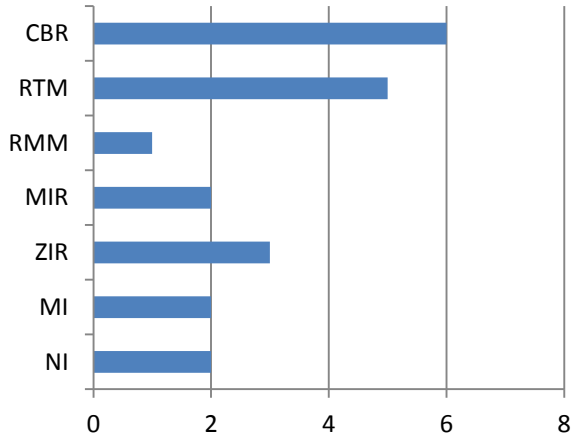
# Evaluation to Adaptation

Anticipated Vulnerability	Mitigation/Adaptation Strategies
Direct Effects of Sea Level Rise	<ul style="list-style-type: none"><li>• Education to reduce CO<sub>2</sub> emissions</li><li>• Sediment deposition (thin-layer)</li><li>• Establish inland migration spaces</li></ul>
Sea Level Rise and Erosion	<ul style="list-style-type: none"><li>• Living shorelines</li><li>• Beach nourishment</li></ul>
Extreme Events and Erosion	<ul style="list-style-type: none"><li>• Create (local) response plans</li></ul>
Extreme Events and Contaminants	<ul style="list-style-type: none"><li>• Source identification</li><li>• Information on potential effects</li><li>• Create/Update response plans</li></ul>
Extreme Events and Invasive Species Temperature and Invasive Species	<ul style="list-style-type: none"><li>• Early detection through monitoring</li><li>• Source identification</li><li>• Remove existing invasive species</li></ul>

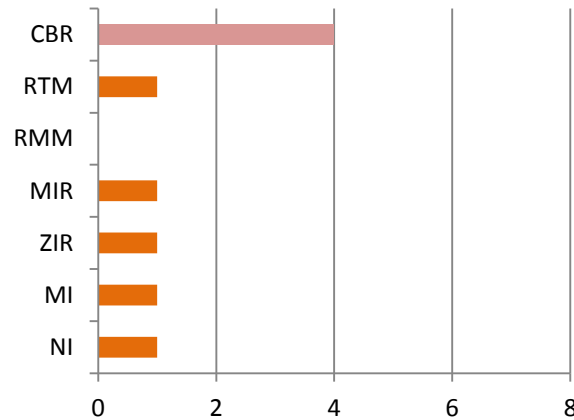


# Invasive Species and Exposure

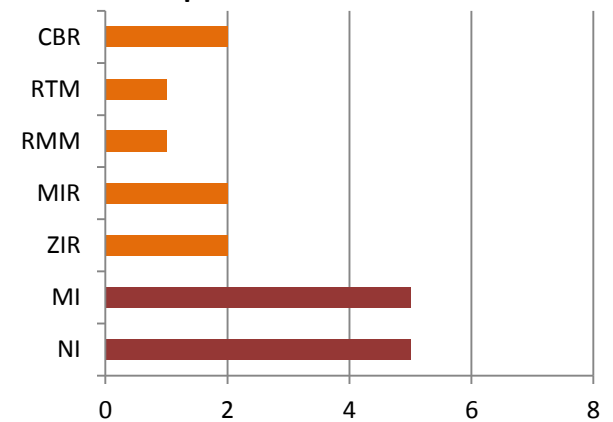
## Current Conditions



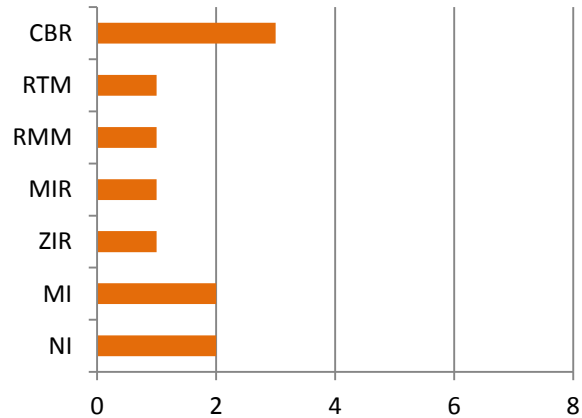
## CO<sub>2</sub>



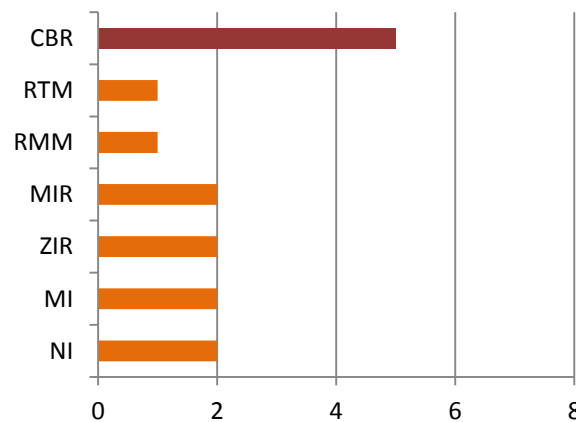
## Temperature



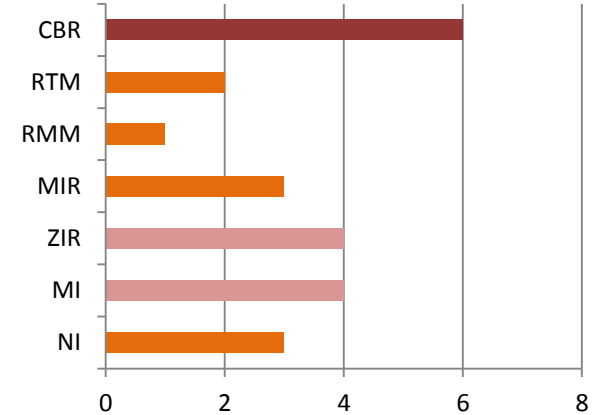
## Precipitation



## Sea Level Rise

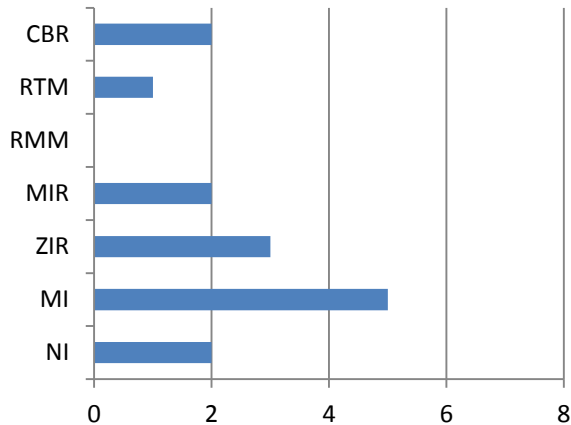


## Extreme Events

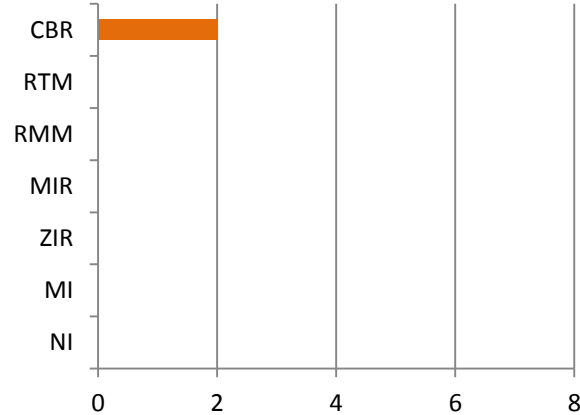


# Nutrients and Exposure

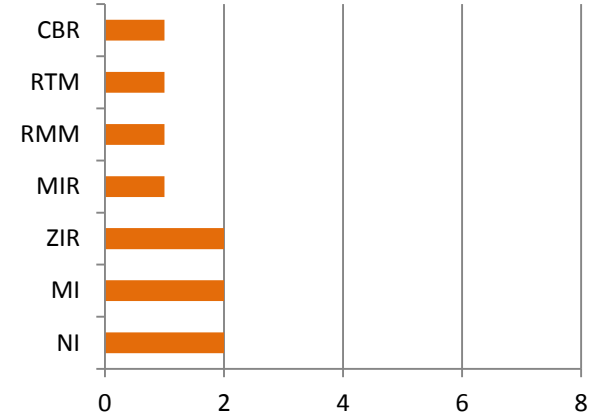
## Current Conditions



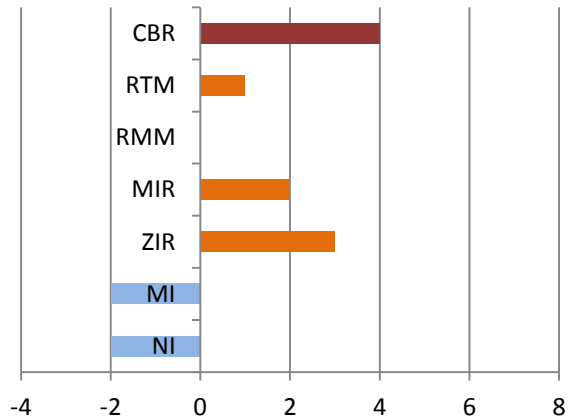
## CO<sub>2</sub>



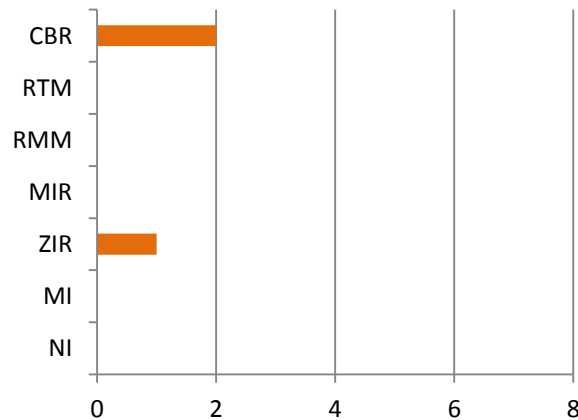
## Temperature



## Precipitation



## Sea Level Rise



## Extreme Events

