

Central Valley Landscape Conservation Project: Vulnerability Assessment Results

Whitney Reynier, Associate Scientist

EcoAdapt

whitney@ecoadapt.org



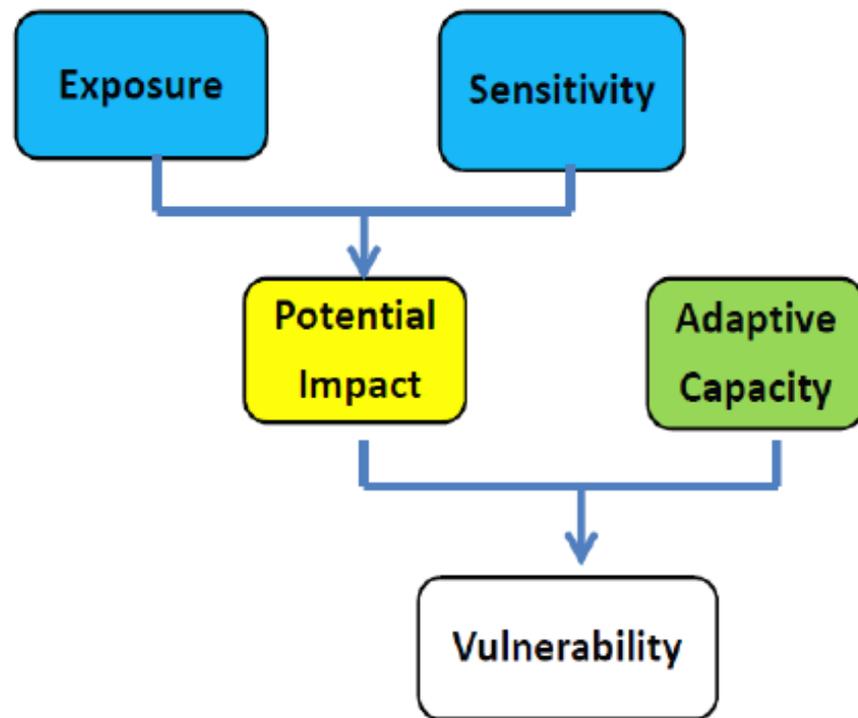
Vulnerability Assessment

IPCC 2007

Vulnerability is....a function of the ***sensitivity*** of a particular resource to climate changes, its ***exposure*** to those changes, and its ***capacity to adapt*** to those changes.

Purpose of a vulnerability assessment:

Identify what resources are ***most vulnerable*** and ***why***



$$V = E * S - AC$$



Assessing Exposure

Climate Variables	Future Projections
Air and Water Temperature	↑
Precipitation	Shifts from snow to rain, drier summers
Snowpack	↓
Runoff and Streamflow	↑ Flooding and winter runoff Earlier spring runoff, reduced summer flows
Climatic water deficit and drought	↑
Wildfire	↑

Measure of how much of a change in climate or other environmental factor a resource is likely to experience.

Exposure: Low (1) to High (5)
Confidence: Low (1) to High (3)



Assessing Sensitivity



Measure of whether and how a resource is likely to be affected by a given change in climate.

Factors affecting habitat sensitivity:

- Climate drivers
- Disturbance regimes
- Non-climate stressors

Sensitivity: Low (1) to High (5)
Confidence: Low (1) to High (3)



Assessing Adaptive Capacity

Ability to accommodate or cope with climate change impacts with minimal disruption.

Factors affecting habitat adaptive capacity:

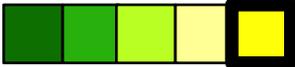
- Extent, integrity, continuity, landscape permeability
- Resistance and recovery
- Diversity
- Management potential

Adaptive Capacity: Low (1) to High (5)
Confidence: Low (1) to High (3)

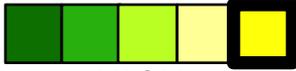
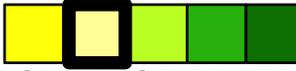


© Blackmb (CC 3.0)



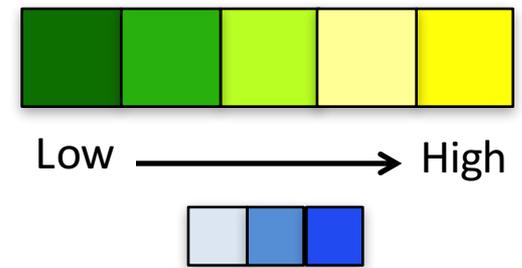
Overall Habitat Vulnerability	Exposure	Sensitivity	Adaptive Capacity
<p><u>DUNES</u></p>  <p>HIGH <i>High Confidence</i></p>	 <p>HIGH</p> <p>↑ Fire, drought, wind</p> <p>△ Precip</p>	 <p>HIGH</p> <p>C: Precip, soil moisture, drought</p> <p>D: Fire, flooding, wind, grazing</p> <p>NC: Development, invasives, ag/range, roads, land use change</p>	 <p>LOW-MODERATE</p> <ul style="list-style-type: none"> - Degraded, isolated, cover only small land area + Climate resilience + Regulatory support



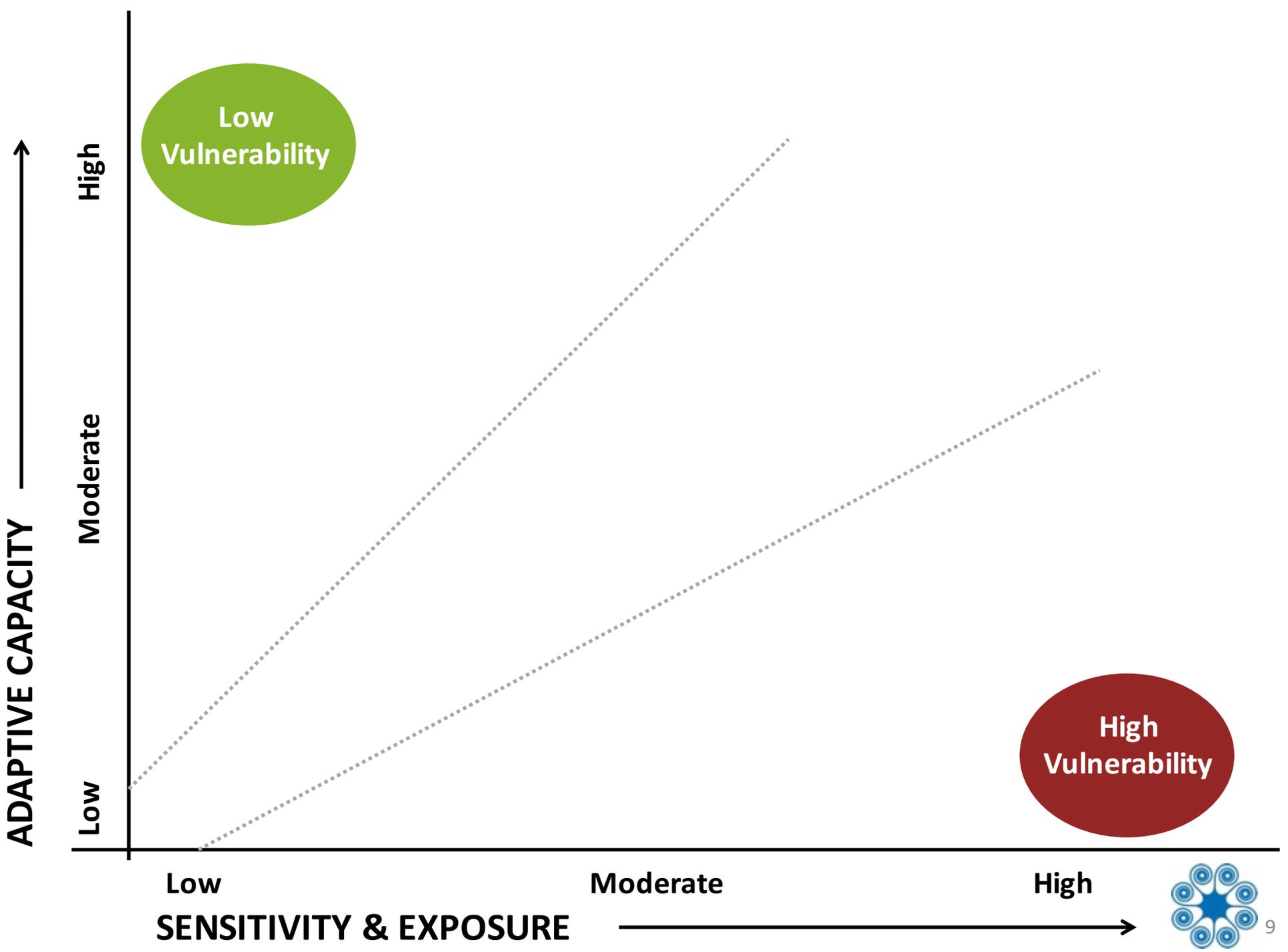
Overall Habitat Vulnerability	Exposure	Sensitivity	Adaptive Capacity
<p><u>DUNES</u></p>  <p>HIGH <i>High Confidence</i></p>	 <p>HIGH</p> <p>↑ Air temp, fire, drought</p> <p>△ Precip, stream flow</p>	 <p>HIGH</p> <p>C: Precip, soil moisture, drought, runoff timing, water temperature</p> <p>D: Fire, flooding, wind, grazing</p> <p>NC: Development, invasives, ag/range, roads, land use change, nutrient loading</p>	 <p>LOW-MODERATE</p> <ul style="list-style-type: none"> - Degraded, isolated, small extent + Disturbance-resilient + Regulatory support (T/E species)
<p><u>PERMANENT WETLANDS</u></p>  <p>MODERATE <i>High Confidence</i></p>	 <p>MODERATE-HIGH</p> <p>↑ Drought</p> <p>↓ Snowpack</p> <p>Earlier runoff</p>	 <p>MODERATE</p> <p>C: Drought, snowpack, precipitation</p> <p>D: Flooding, wind, fire</p> <p>NC: Nutrient loading, land use change, invasives</p>	 <p>MODERATE</p> <ul style="list-style-type: none"> - Altered and isolated + Managed system + Species and functional group diversity + Legislative, regulatory, and hunting support + Ecosystem services



Relative Vulnerability: Habitats



HABITAT	VULNERABILITY SCORE	CONFIDENCE SCORE
Dunes	High	High
Stream Channel	High	High
Riparian Vegetation	Moderate-High	High
Grassland	Moderate-High	High
San Joaquin Desert	Moderate-High	High
Vernal Pools & Swales	Moderate-High	High
Flooded Croplands	Moderate	High
Permanent Wetlands	Moderate	High
Seasonal Wetlands	Moderate	High
Rice Croplands	Moderate	High
Chaparral & Serpentine	Moderate	High
Oak Woodlands	Moderate	High



Low Vulnerability

High Vulnerability



Habitats

ADAPTIVE CAPACITY

High
Moderate
Low

Low
Vulnerability

High
Vulnerability

Low
SENSITIVITY & EXPOSURE

Moderate

High

Oak Woodlands

Vernal Pools & Swales

Grasslands

Flooded Cropland

Seasonal Wetlands

Riparian Vegetation

Rice Croplands

San Joaquin Desert

Chaparral & Serpentine

Permanent Wetlands

Stream Channel

Dunes

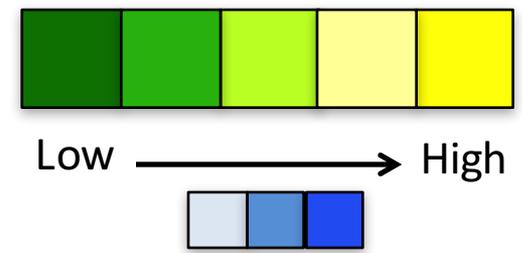
2
1

*

*

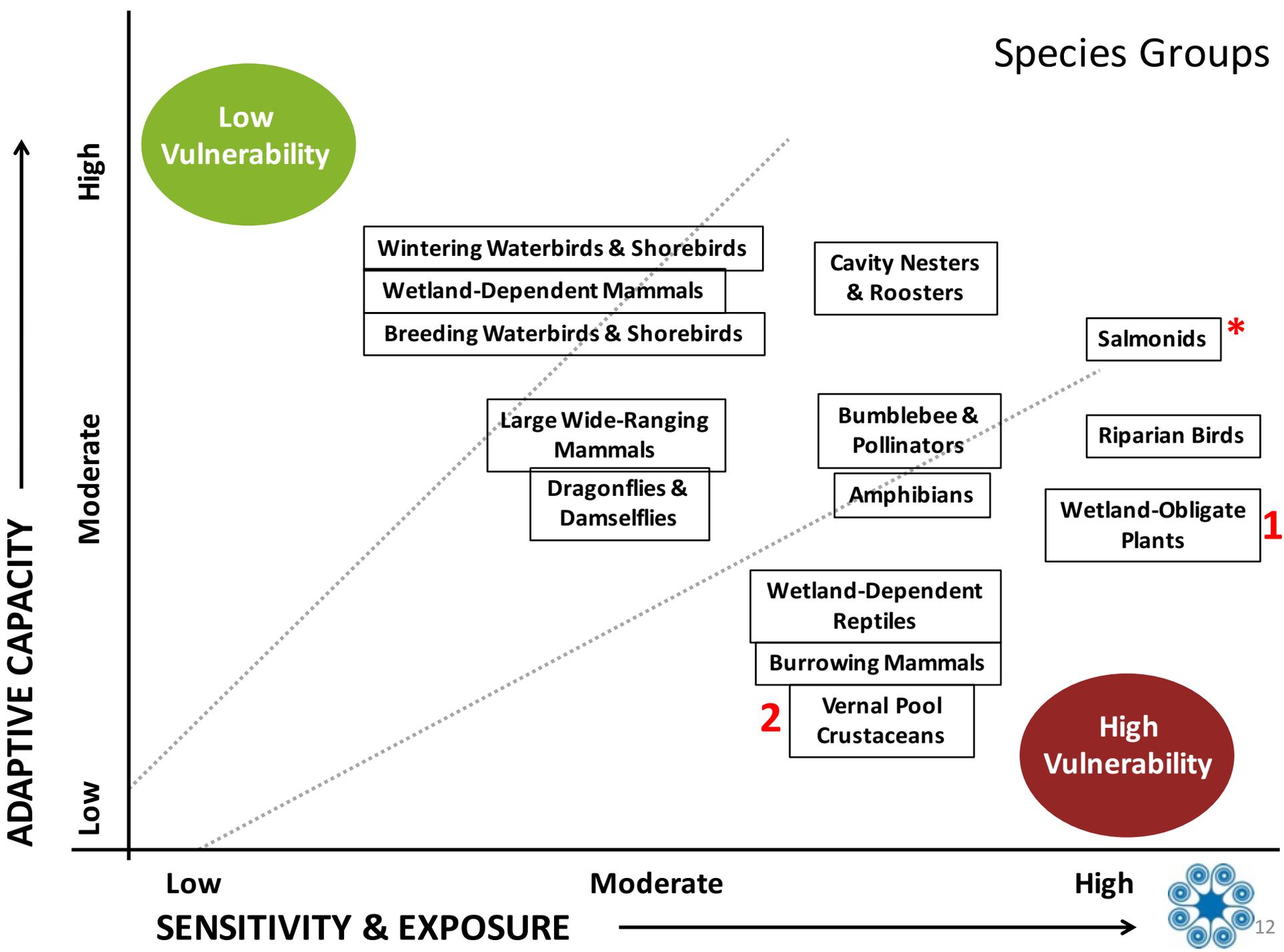


Relative Vulnerability: Species Groups

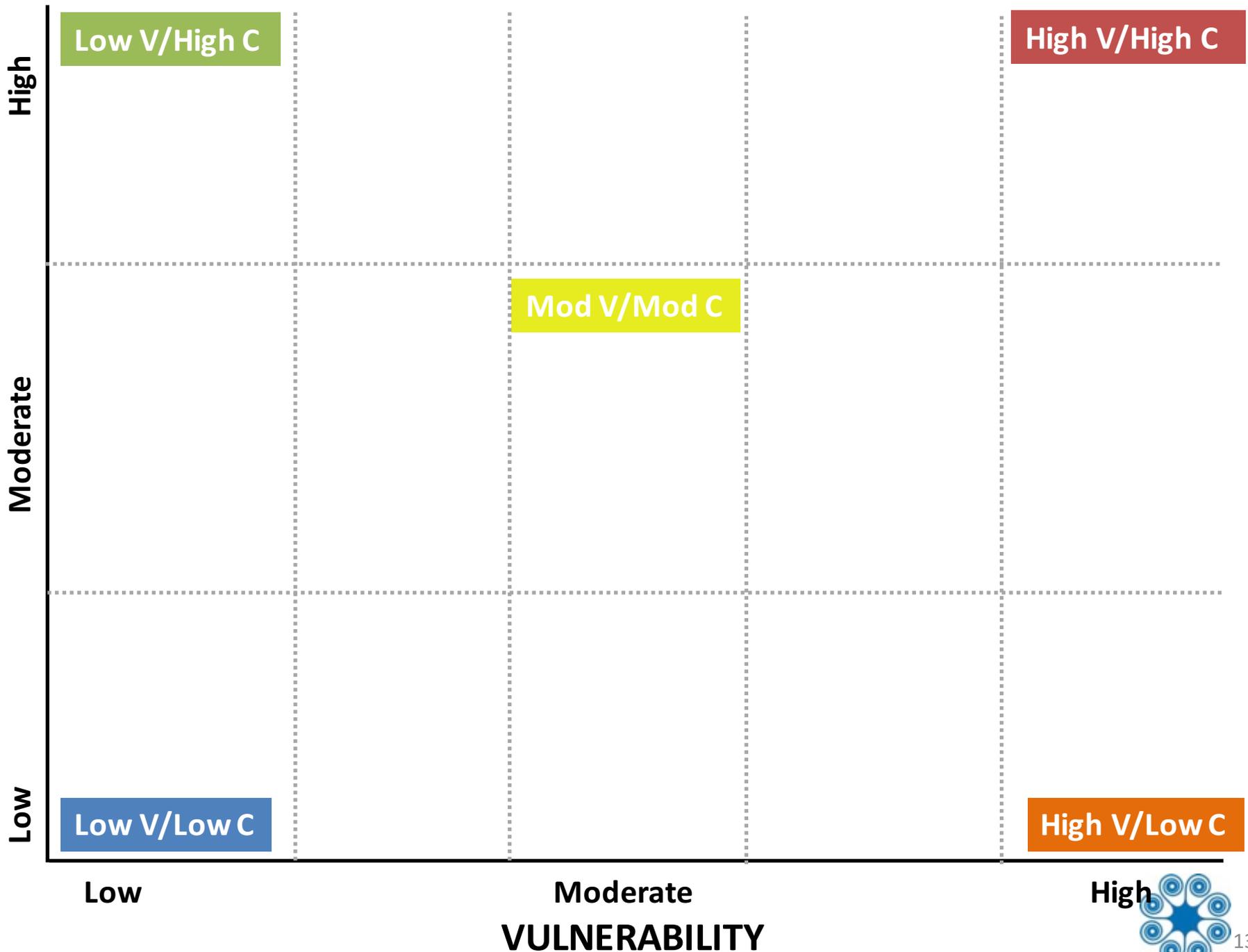


HABITAT	VULNERABILITY SCORE	CONFIDENCE SCORE
Salmonids	High	High
Vernal Pool Crustaceans	Moderate-High	High
Wetland-Obligate Plants	Moderate-High	High
Burrowing Mammals	Moderate-High	High
Riparian Birds	Moderate-High	High
Western Bumblebee & Pollinators	Moderate-High	High
Wetland-Dependent Reptiles	Moderate-High	Moderate
Amphibians	Moderate	High
Cavity Nesters & Roosters	Moderate	Moderate
Dragonflies & Damselflies	Moderate	Moderate
Breeding Waterbirds & Shorebirds	Moderate	Moderate
Wetland-Dependent Mammals	Low-Moderate	High
Large Wide-Ranging Mammals	Low-Moderate	High
Wintering Waterbirds & Shorebirds	Low-Moderate	High

Species Groups



CONFIDENCE



Low

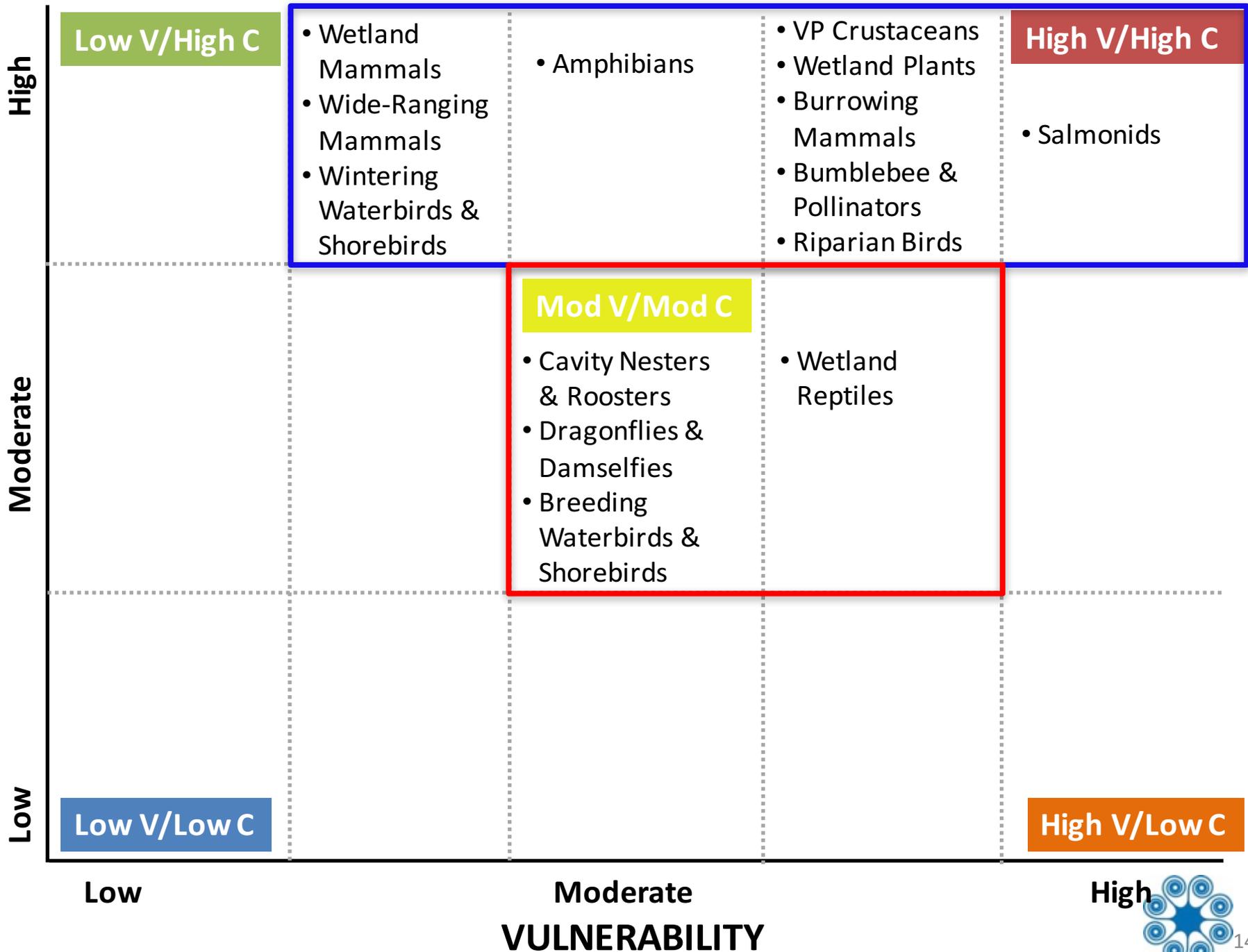
Moderate

High

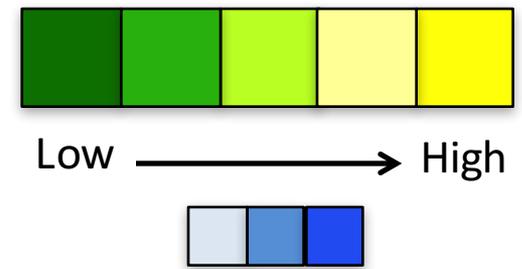
VULNERABILITY



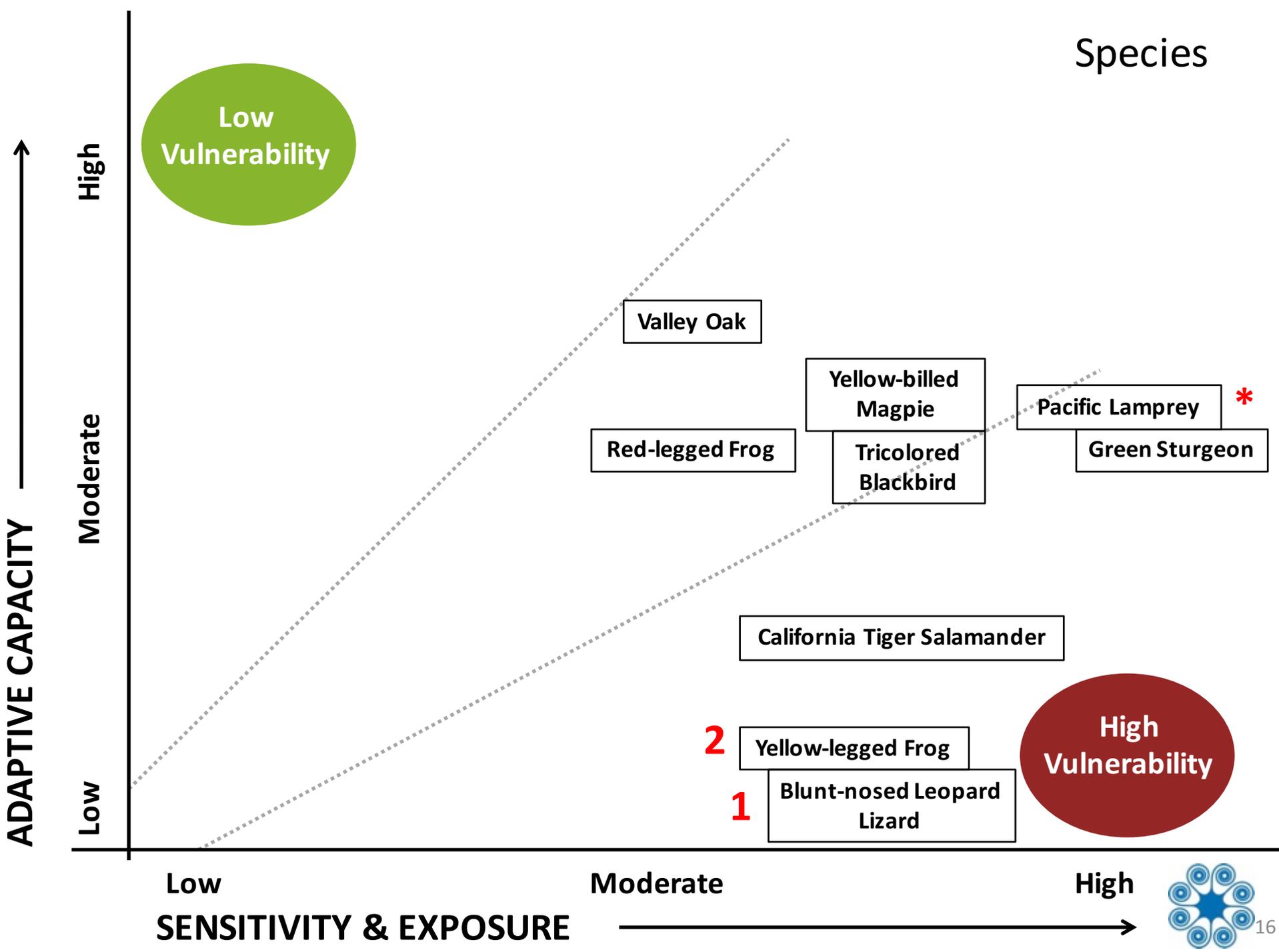
CONFIDENCE



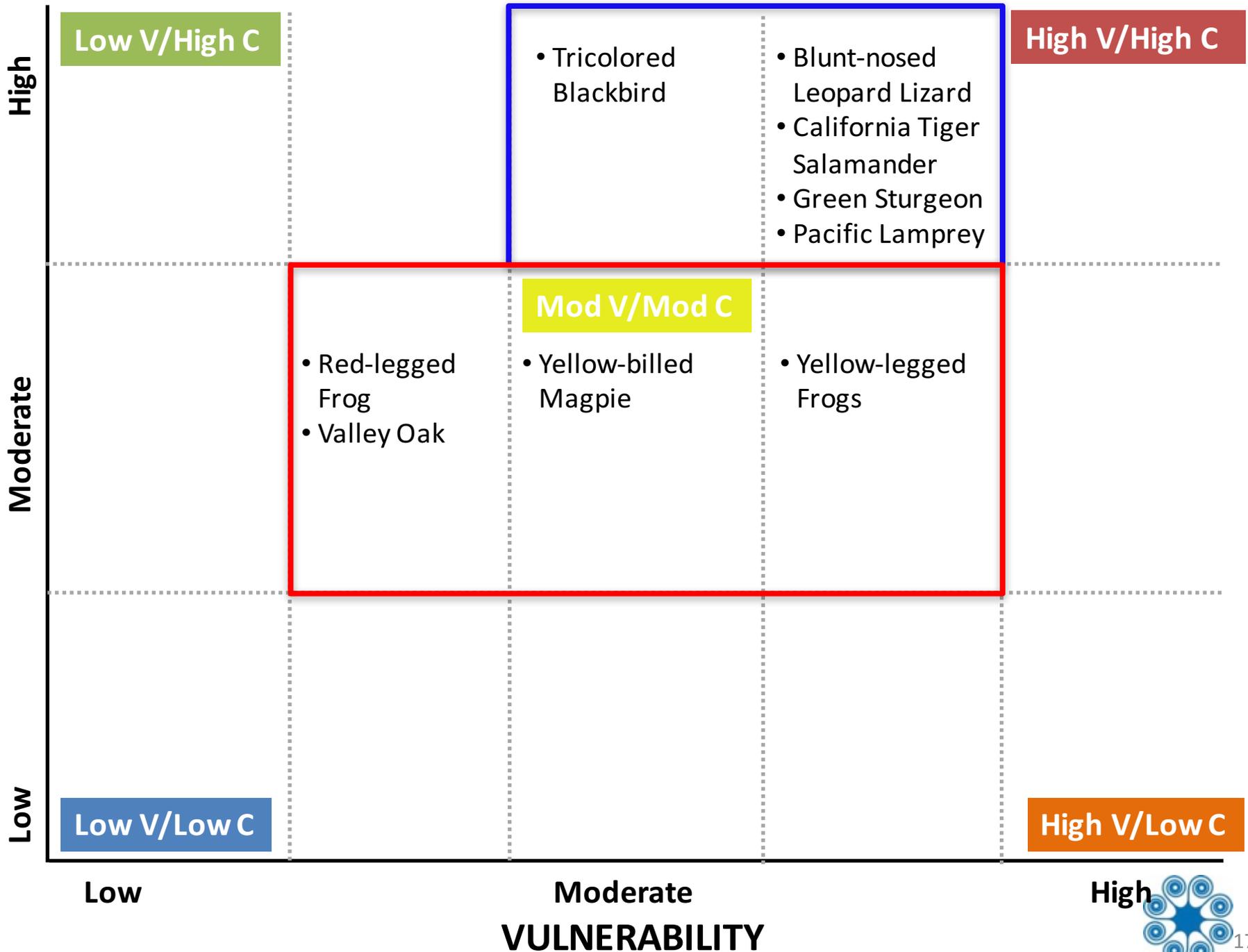
Relative Vulnerability: Species



HABITAT	VULNERABILITY SCORE	CONFIDENCE SCORE
Blunt-nosed Leopard Lizard	Moderate-High	High
Green Sturgeon	Moderate-High	High
California Tiger Salamander	Moderate-High	High
Pacific Lamprey	Moderate-High	High
Yellow-Legged Frog	Moderate-High	Moderate
Tri-Colored Blackbird	Moderate	High
Yellow-Billed Magpie	Moderate	Moderate
Red-Legged Frog	Low-Moderate	Moderate
Valley Oak	Low-Moderate	Moderate



CONFIDENCE



Vulnerability Assessment Trends



Climate Stressors

- Precipitation variability
- Drought
- Soil moisture (H only)
- Storms (SG only)
- Water temperature (S only)



Non-Climate Stressors

- Urban/suburban development
- Agricultural & rangeland practices
- Land use change
- Invasive species
- Pollutions & poisons (SG/S only)
- Dams, levees & water diversions (S only)

Vulnerability Assessment Trends (continued)

Adaptive Capacity

- Low connectivity
- Many habitats & populations degraded
- + Diversity
- + Management potential:
 - + Agricultural/rangeland management
 - + Societal value
 - + Regulatory support



Products and Applications

Adaptation Ladder of Engagement®

7 Sharing

6 Evaluation

5 Integration

4 Implementation

3 Planning

2 Assessment

1 Awareness

brought to you by **EcoAdapt™**

Vulnerability Assessment Report (drafts out for review)

Grasslands

Executive Summary

Central Valley grasslands are open grasslands that support a diversity of annual and perennial plant species. Grasslands are characterized by winter precipitation and seasonal summer drought, and exhibit high temporal and spatial diversity.

Grasslands	Score ¹	Confidence
Sensitivity	High (5)	High (3)
Exposure	High (5)	High (3)
Adaptive Capacity	Moderate (3)	High (3)
Vulnerability	Moderate-High (4)	High (3)

Key climate drivers for grassland systems include soil moisture, precipitation timing and amount, drought, and air temperature. These factors influence germination, species composition and diversity, productivity, and phenology. Key disturbance mechanisms are grazing, wildfire, and insects; all of these factors influence invasive species pressure, species composition, and grassland biomass. Key non-climate stressors include urban/suburban development, agricultural and rangeland practices, land use change, nutrient loading, invasive and problematic species, and roads, highways, and trails. These stressors fragment and destroy habitat, alter species composition, and typically increase vulnerability to invasion. Exotic annual species have significantly altered the structure and function of California grasslands.

Grasslands represent a significant portion of Central Valley surface area, but have experienced varying levels of habitat fragmentation and alteration, primarily from agricultural and urban development and exotic species establishment and dominance. Many of the non-climate stressors listed above, in addition to energy production and mining, act as landscape barriers. Although grassland habitats have been extensively altered, they still support high floristic and wildlife diversity. Resilience varies amongst component species; wildflowers have demonstrated diversity losses in response to warmer and drier conditions. In general, annual species resilience is fostered by persistent seedbanks, while perennial species resilience is tied with deeper rooting systems, which facilitate tolerance of short-term precipitation fluctuations. However, native dispersal may be limited and natural recovery of invaded or altered systems is difficult, limiting migration and recovery potential in response to climate stressors and habitat fragmentation. Management potential for grassland systems is likely influenced by agricultural area restoration efforts, invasive species control, and rangeland management practices.

