

Vulnerability Assessment Results

Golden Gate Biosphere Network Adaptation Project



**Golden Gate
Biosphere Network**
ESTD. 1988



Vulnerability Assessment Results

Golden Gate Biosphere Network Adaptation Project



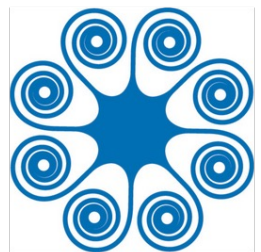
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Defining Vulnerability

Climate change vulnerability

refers to the degree to which a resource is susceptible to and/or unable to cope with the adverse impacts of climate change



Vulnerability Assessment

Purpose of a vulnerability assessment:

Identify which resources are most vulnerable and why

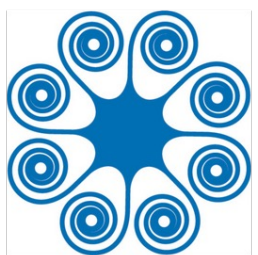
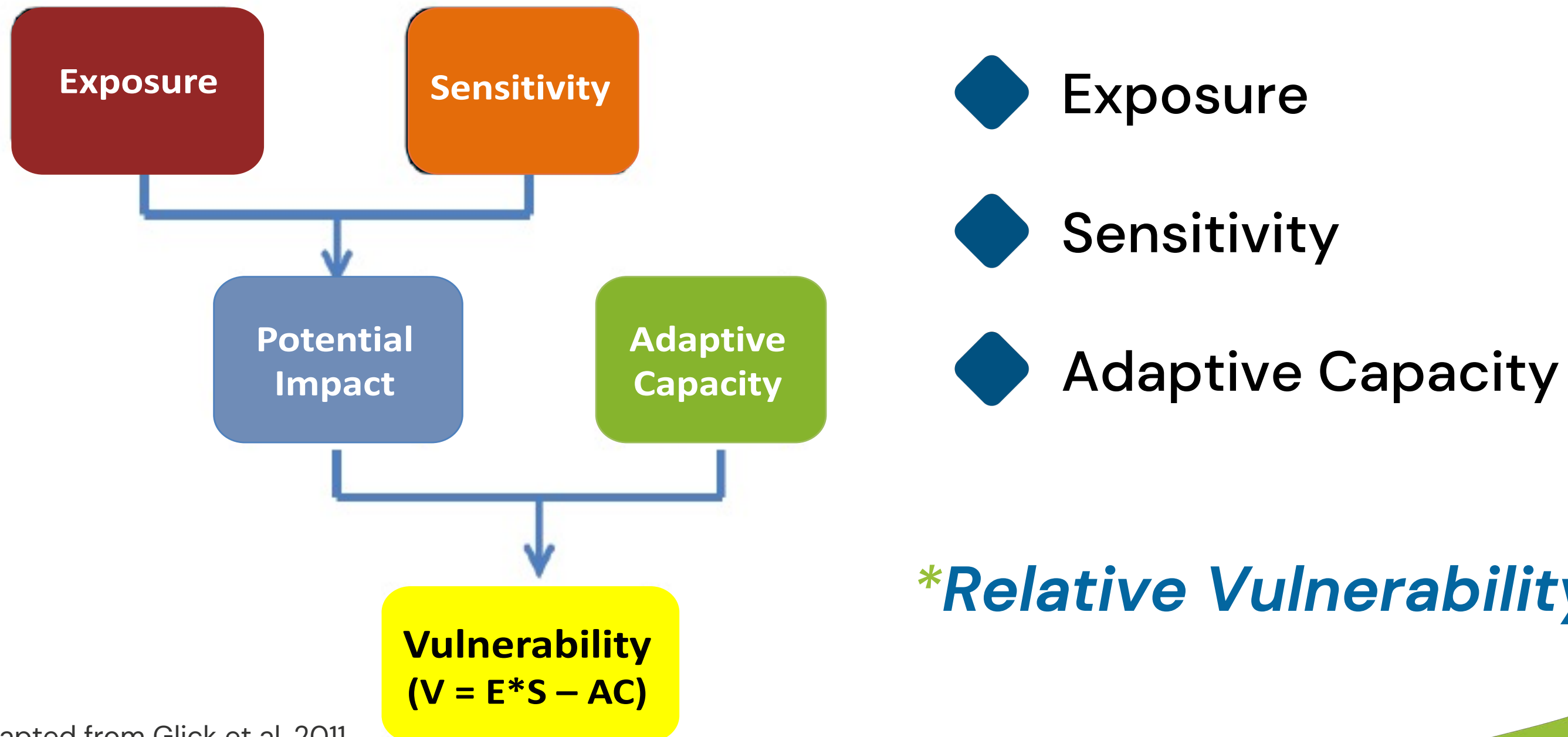


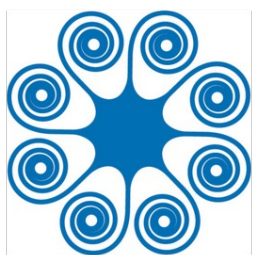
Figure adapted from Glick et al. 2011

Assessing Exposure

Exposure is a measure of how much change in climate that resource is likely to experience

Factors affecting exposure

- ◆ Direction and magnitude of change in climate stressors and disturbance regimes
- ◆ Degree of uncertainty associated with projected changes

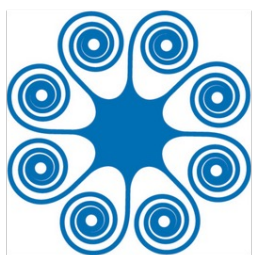


Assessing Sensitivity

Sensitivity is a measure of whether and how a resource is likely to be affected by a given change in climate factors

Factors affecting sensitivity

- ◆ Climate stressors
- ◆ Disturbance regimes
- ◆ Non-climate stressors



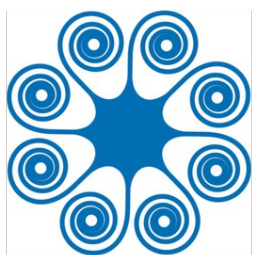
Assessing Adaptive Capacity

Adaptive Capacity is a measure of a resource's ability to accommodate or cope with climate change impacts with minimal disruption

Factors affecting adaptive capacity

- ◆ Extent and integrity
- ◆ Connectivity
- ◆ Resistance and recovery
- ◆ Diversity
- ◆ Public, societal, and cultural value
- ◆ Management potential

❖ *Plasticity*



Why Assess Vulnerability?

Vulnerability assessments can...



Prioritize the focus of management actions

Develop strategies to address climate change

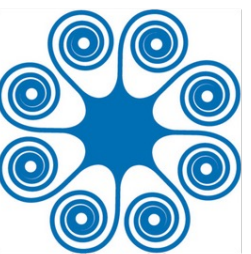
Efficiently allocate resources



Why Assess Vulnerability?

**Vulnerability assessments
cannot...**

Make a management decision for you



What Did We Do?

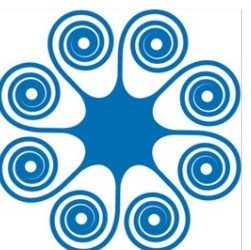


**Expert
Assessment**



**Review of
scientific literature**

- Vulnerability assessment two-day virtual workshop
- Vulnerability assessment worksheets for ecosystems and species
- 21 total assessments



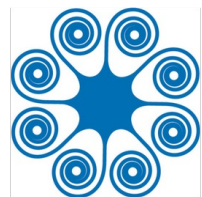
Vulnerability Assessments

10 ecosystems

Open oak woodlands/savannahs*
Coastal redwood forests*
Maritime chaparral
Freshwater marshes
Coastal prairie*
Coastal scrub
Mixed evergreen forests
Riparian forests/woodlands*
Coastal dunes*
Tidal marshes*

11 species

Mountain lion
Belted kingfisher
San Francisco common yellowthroat
Sanderlings
California black oak
Western leatherwood
Serpentine endemic rare plants
California red-legged frog
Coho and steelhead*
Mission blue butterfly*
San Bruno elfin butterfly*



Vulnerability Results: *Coastal Redwood Forests*



Impact (Sensitivity + Exposure)



High Impact
Moderate Confidence

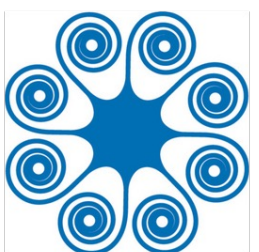
- ↓↑ Precipitation amount/timing
- ↑ Drought
- ↓ Soil moisture
- ↓ Coastal fog
- ↑ Air temperature
- ↓↑ Altered stream flow
- Decreased redwood growth and seedling recruitment
- Increased evaporative demand and water stress
- Increased erosion and sedimentation
- *Wildfire regimes*
- *Non-climate stressors*: historic timber harvest, fire exclusion and suppression, invasive species, non-native pathogens, recreational use, dams and water diversions

Adaptive Capacity

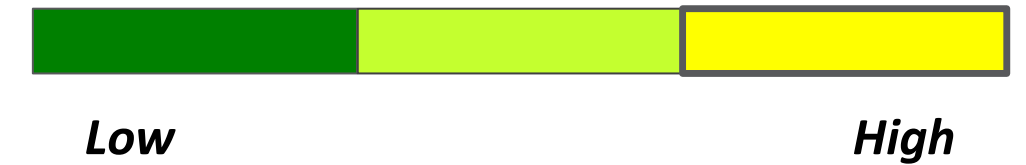


Moderate AC
High Confidence

- ▲ Public value and societal support
- ▲ Resistance to disturbances
- ▲ Relatively diverse species composition and habitat structure of old-growth forests
- ▼ Low structural complexity and associated biodiversity of young forests
- ▼ Fragmentation and loss of connectivity



Vulnerability Results: *Coho and steelhead*



Impact (Sensitivity + Exposure)



High Impact

Moderate Confidence

- ↑ Freshwater temperature
- ↑ Air temperature/heat waves
- ↓ ↑ Precipitation amount/timing
- ↓ ↑ Altered streamflow
- ↑ Drought
- ↑ Sea level rise
- Increase in pathogens and algal blooms
- Disturbance and destruction of incubating eggs
- Barriers to spawning migration
- Reduction in habitat
- Decline water quality
- *Non-climate stressors:* dams and diversions, timber harvesting, development, livestock grazing and agriculture, pollution, invasive species, fire exclusion and suppression, hatchery production

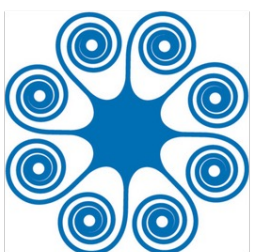
Adaptive Capacity



Low AC

High Confidence

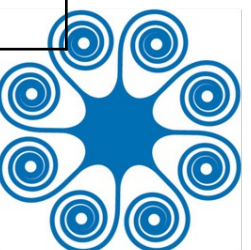
- ▲ Juvenile steelhead may benefit from higher temperatures
- ▲ Flexibility and varied life history - steelhead
- ▲ Strong public support and interest and high societal value
- ▼ Endangered with limited distribution/extirpation
- ▼ Influx of contaminants
- ▼ Existing barriers – impacts on migration and spawning



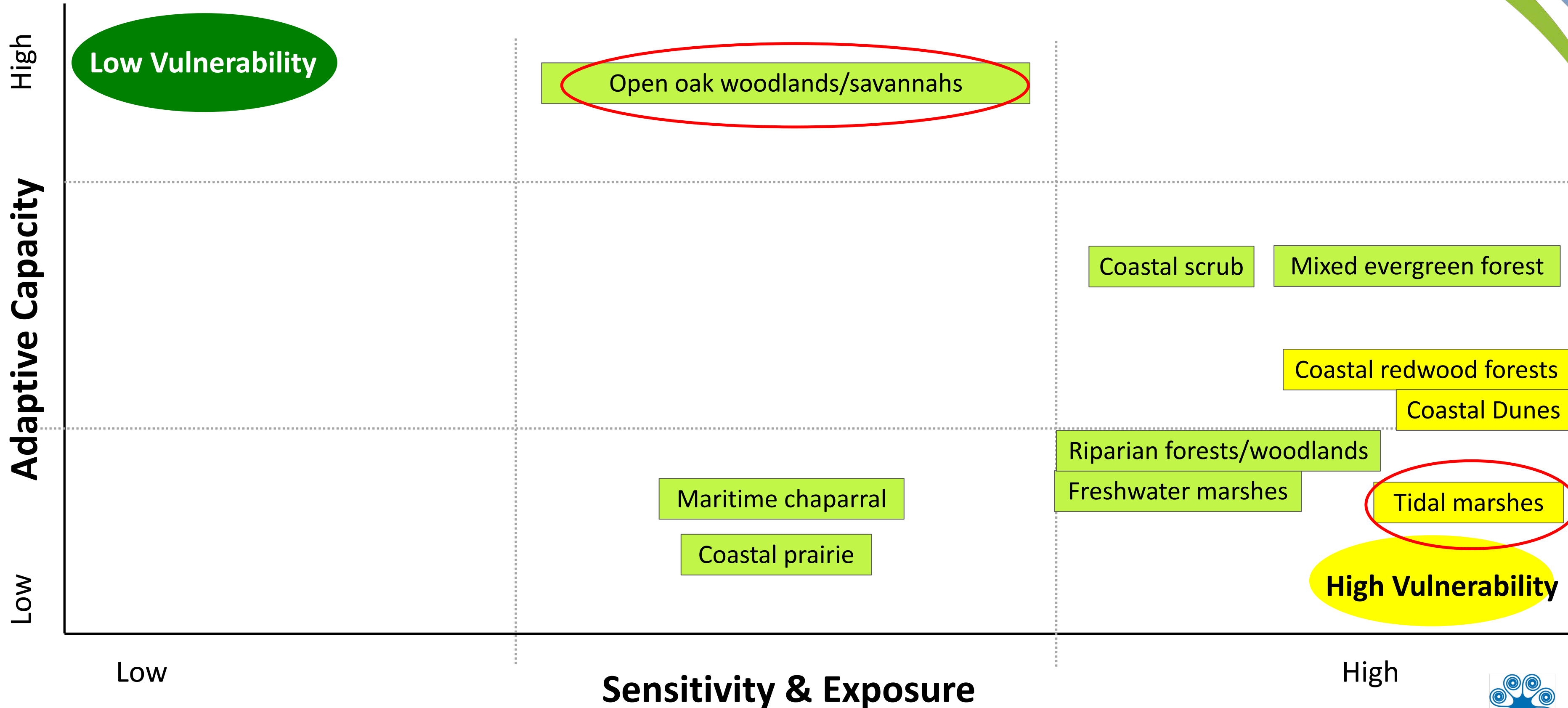
Relative Vulnerability: Ecosystems



Ecosystem	Vulnerability Score	Confidence Score
Open oak woodlands/savannahs	Moderate	Moderate
Maritime chaparral	Moderate	Moderate
Freshwater marshes	Moderate	Moderate
Coastal prairie	Moderate	Moderate
Mixed evergreen forests	Moderate	Moderate
Riparian forests/woodlands	Moderate	Moderate
Coastal scrub	Moderate	High
Coastal redwood forests	High	Moderate
Coastal dunes	High	Moderate
Tidal marshes	High	Moderate



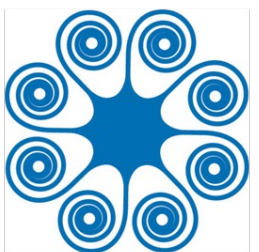
Relative Vulnerability: Ecosystems



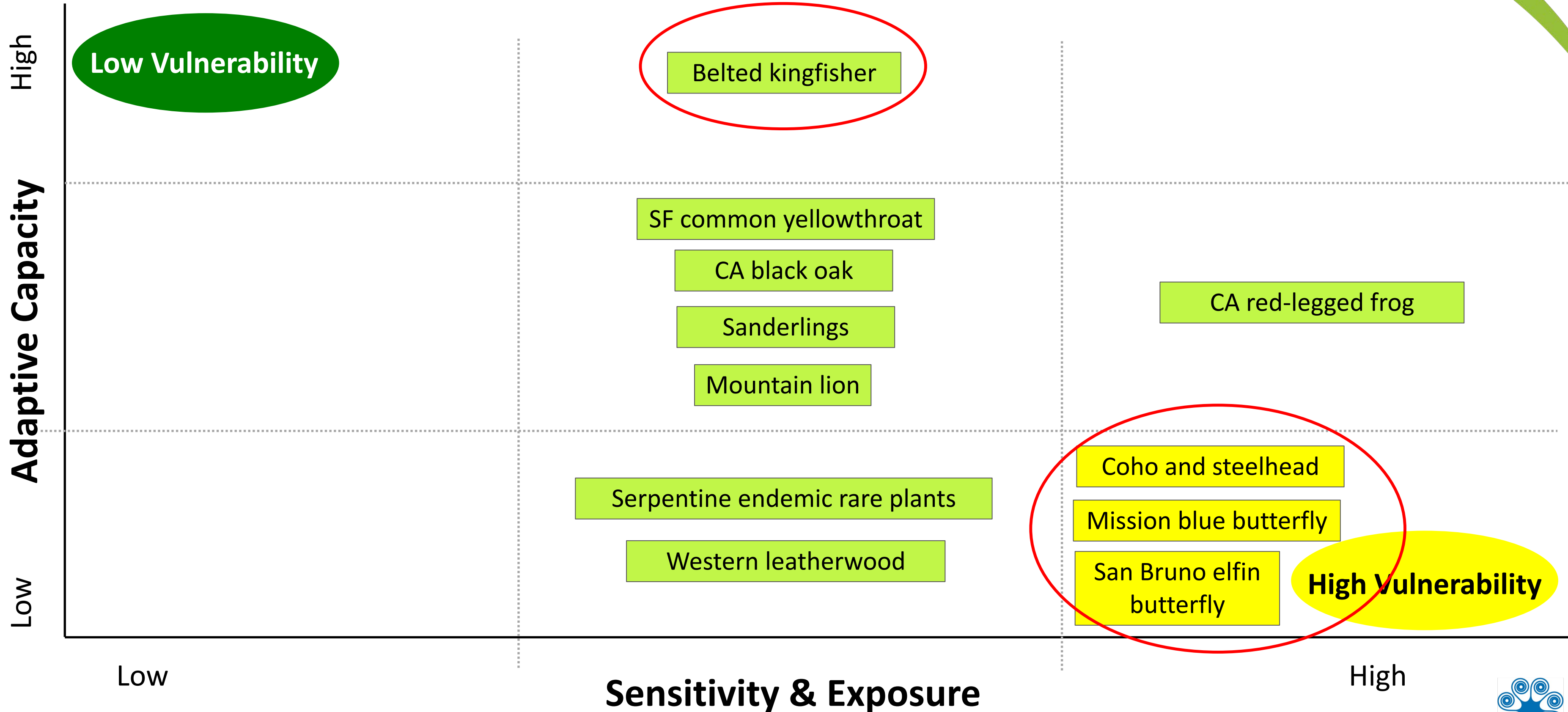
Relative Vulnerability: Species



Species	Vulnerability Score	Confidence Score
Belted kingfisher	Moderate	Moderate
San Francisco common yellowthroat	Moderate	Moderate
Sanderlings	Moderate	Moderate
California black oak	Moderate	Moderate
Western leatherwood	Moderate	Moderate
Serpentine endemic rare plants	Moderate	Moderate
California red-legged frog	Moderate	Moderate
Mountain lion	Moderate	High
Mission blue butterfly	High	Moderate
San Bruno elfin butterfly	High	Moderate
Coho and steelhead	High	High



Relative Vulnerability: Species



Vulnerability Assessment Trends Overall

Climate Stressors

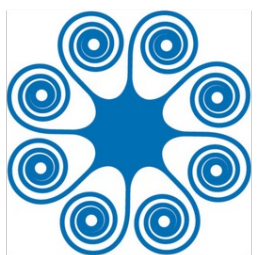
- Freshwater temperature
- Soil moisture/drought
- Air temperature/heat waves
- Altered streamflow
- Sea level rise

Disturbance Regimes

- Wildfire
- Extreme storms and flooding

Non-Climate Stressors

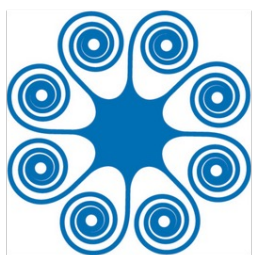
- Residential/commercial development
- Fire exclusion/suppression
- Roads, highways, and trails
- Invasive/problematic species
- Dams & water diversions
- Pollution/poisons



Vulnerability Assessment Trends Overall

Adaptive Capacity Factors

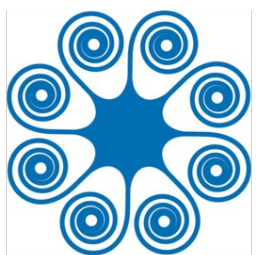
- ▲ Public value and societal support
- ▲ Ability and capacity of managers to manage/cope with climate impacts
- ▲ Diverse species composition and habitat structure
- ▲ Resistance to/dependent on disturbances
- ▲ Potential to serve as refugia



Vulnerability Assessment Trends Overall

Adaptive Capacity Factors

- ▼ Endangered or threatened
- ▼ Influx of pollutants
- ▼ Existing barriers to dispersal (natural and manmade) – urban development & land conversion
- ▼ Conflicts or competing interests
- ▼ Isolated species populations
- ▼ Fragmented ecosystems



Questions?

