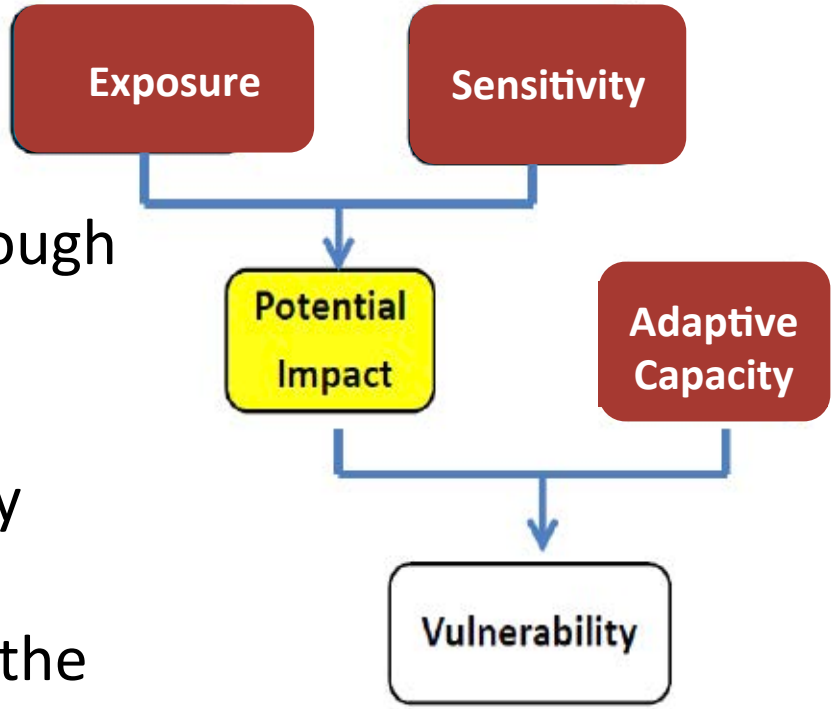
Scenario Planning

Recap of Day 1 & Next Steps on VA

- Expert input and analysis of vulnerabilities for each resource, including confidence levels and uncertainties
- Send out transcribed worksheets for your review
- Evaluate resource vulnerabilities through a thorough review of the scientific literature
  - Rank components of vulnerability and write short summaries describing key information from the literature
- Peer review of draft products by experts



Example Products

Southern California River and Stream Habitats

Climate Change Vulnerability Assessment Summary

An Important Note About this Document: *This document represents an initial evaluation of vulnerability for river and stream habitats based on expert input and existing information. Specifically, the information presented below comprises habitat expert vulnerability assessment survey results and comments, peer-review comments and revisions, and relevant references from the literature. The aim of this document is to expand understanding of habitat vulnerability to changing climate conditions, and to provide a foundation for developing appropriate adaptation responses.*

Habitat Description

Rivers and streams are powerful drivers of landscape patterns and ecological communities, and provide California's most valuable forest resource: water. Rivers and streams in southern California are primarily fed by precipitation, surface runoff, and groundwater discharge; historically, peak flows and flooding occur in winter and spring, and low- or no-flow conditions often occur in the summer and fall.[1,2] This assessment includes both perennial and ephemeral systems, as well as associated riparian vegetation.

Habitat Vulnerability

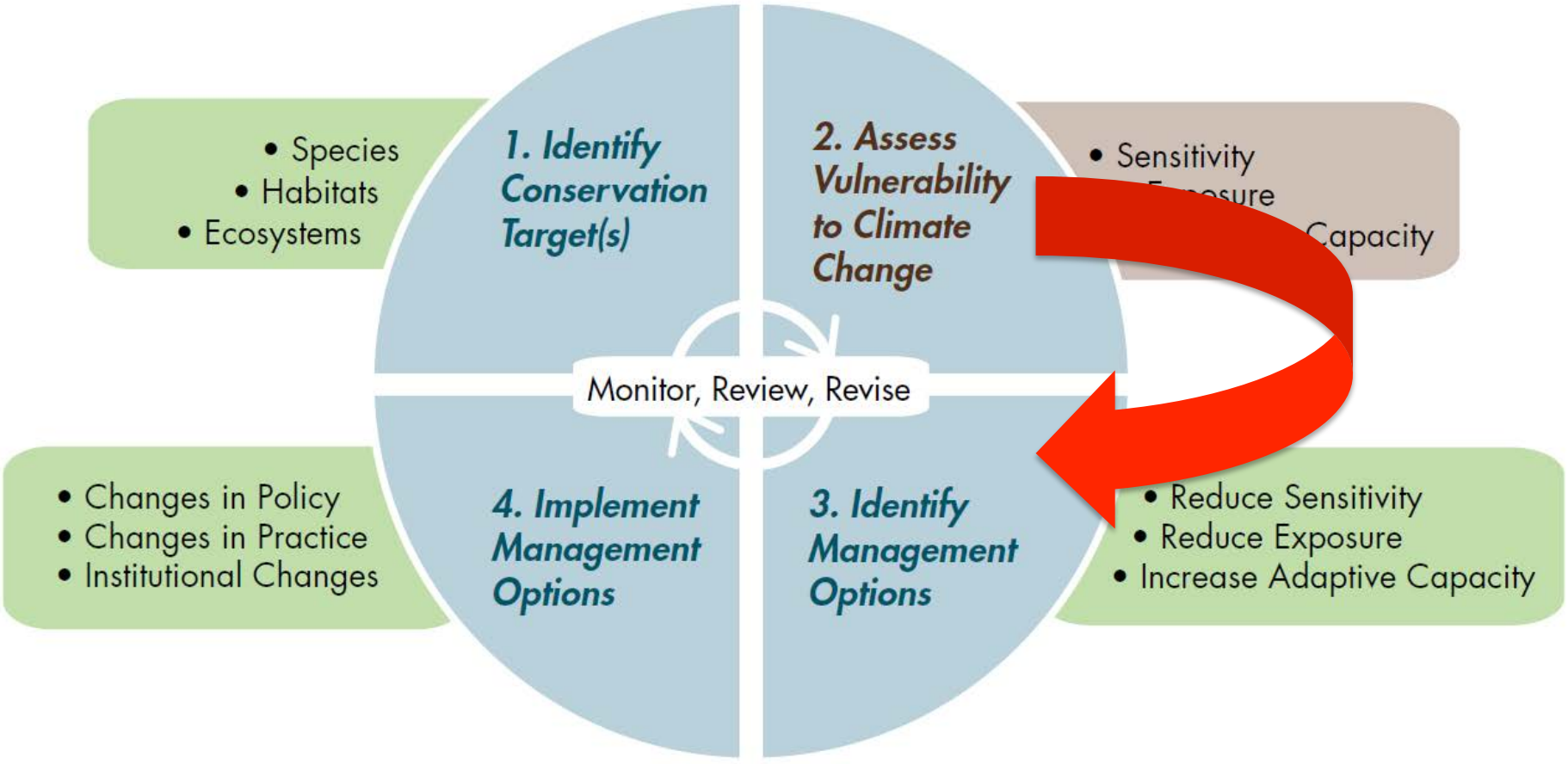
Moderate Vulnerability

The relative vulnerability of rivers and streams in southern California was evaluated to be moderate by habitat experts due to moderate-high sensitivity to climate and non-climate stressors, moderate exposure to future climate changes, and moderate adaptive capacity.

Summary documents that identify:

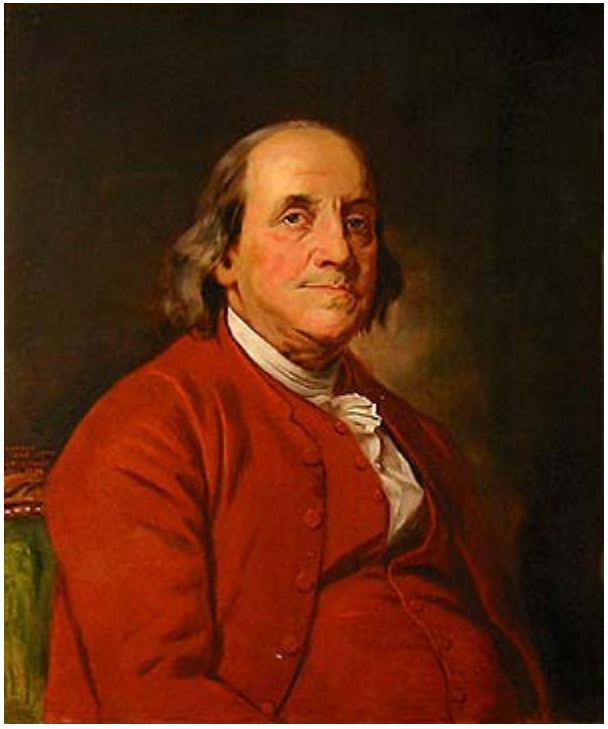
- Overall vulnerability
- Sensitivity
  - Climate
  - Disturbance
  - Non-climate
- Exposure
- Adaptive capacity
- All associated with confidence rankings and documented uncertainty

Overarching Conservation Goal(s)



Certain: death and taxes

Uncertain: everything else



Uncertainty under Climate Change

Responses to Uncertainty

Denial

Oversimplify

Express false confidence

Paralysis

Plan for everything

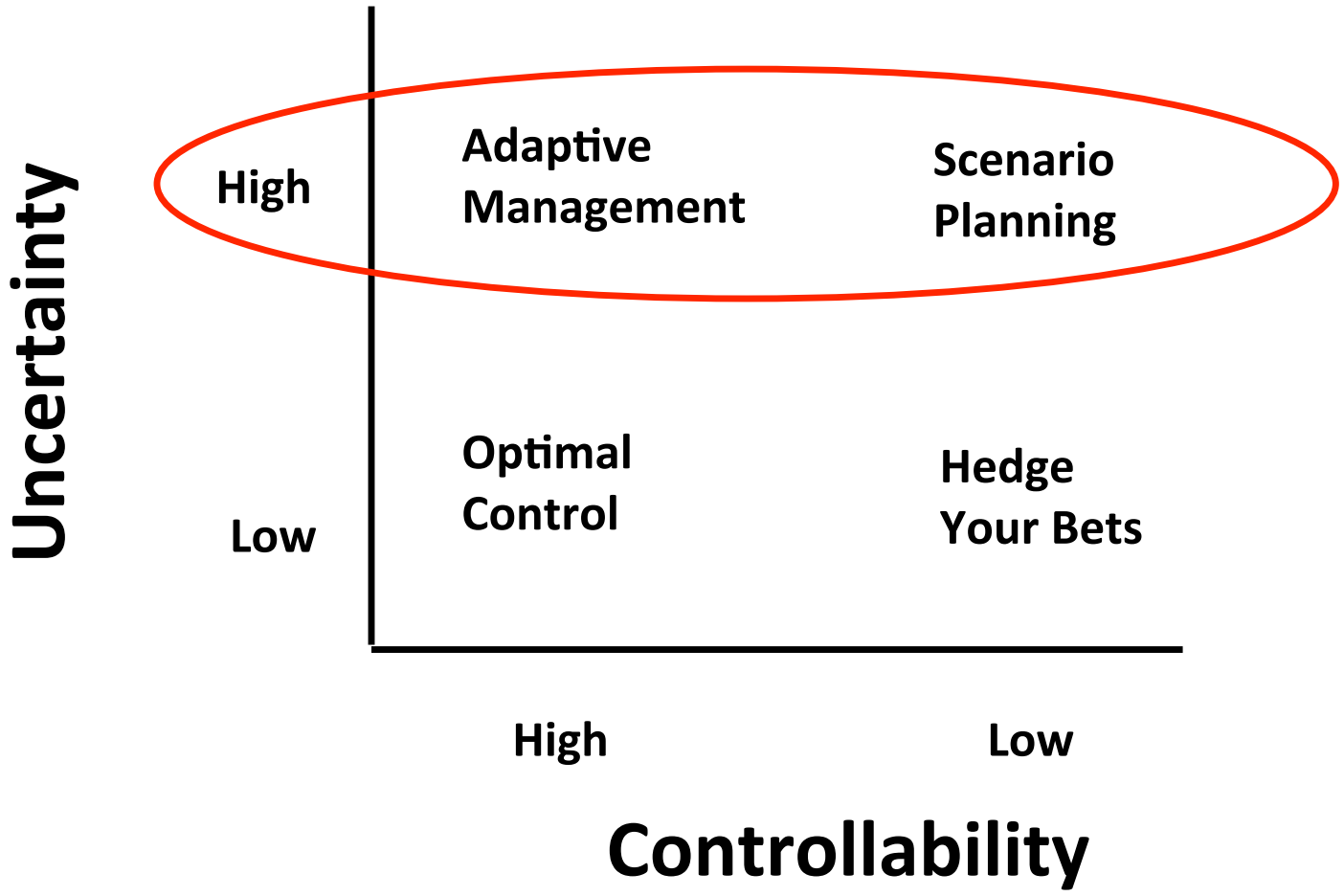
Wait and see

Addressing Uncertainty

- Natural resource management has always faced uncertainty
  - Anxiety about uncertainty often leads to "analysis paralysis"
  - Don't deny it, embrace it
- Document where/why there is uncertainty
- Three types of uncertainty
  - Climate projections
  - Ecological responses
  - Management effectiveness

Likelihood Scale	
Terminology	**Likelihood of the Occurrence/Outcome**
Virtually certain	>99 percent probability of occurrence
Very likely	>90 percent probability
Likely	>66 percent probability
About as likely as not	33 to 66 percent probability
Unlikely	<33 percent probability
Very unlikely	<10 percent probability
Exceptionally unlikely	<1 percent probability

- Distinguish between uncertainty in trend vs. rate & magnitude

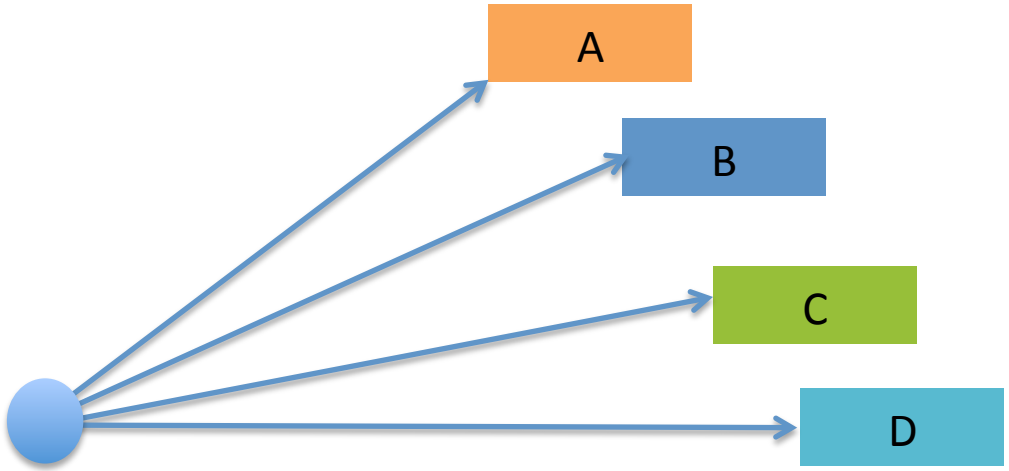


Adapted from Peterson et al 2003

What is scenario planning?

A process in which we envision multiple plausible futures, and consider effects on our priorities and decisions

Scenarios → plausible futures that we develop given what we know from science and expert knowledge

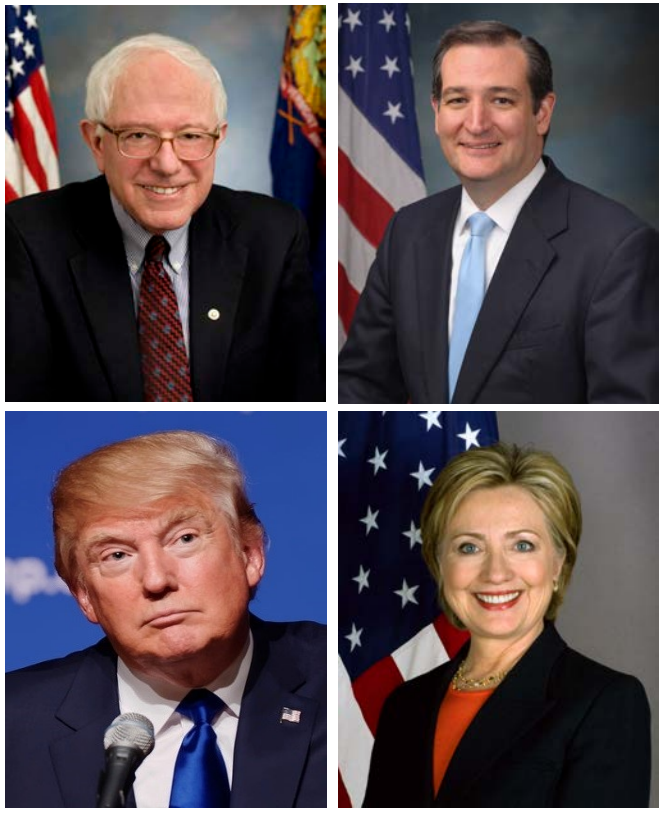


What is scenario planning?

Scenario planning is a method for…..

- exploring what the future *could* look like
- comparing how resources *could* be affected
- comparing what management actions *could* be taken

Expert knowledge-driven rather than analysis-driven



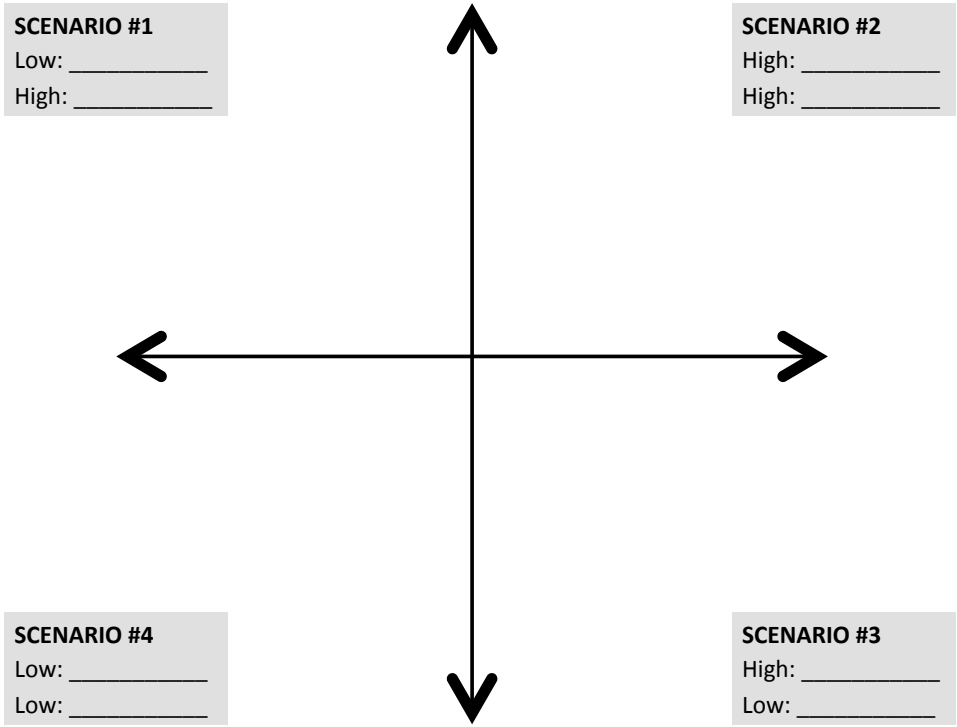
Why scenario planning?

UNCERTAINTY

- Rate, magnitude, direction of change
- Ecosystem or species responses

COMPLEXITY

- Interacting stressors: land use change, institutional capacity, social systems, ecological relationships, etc.

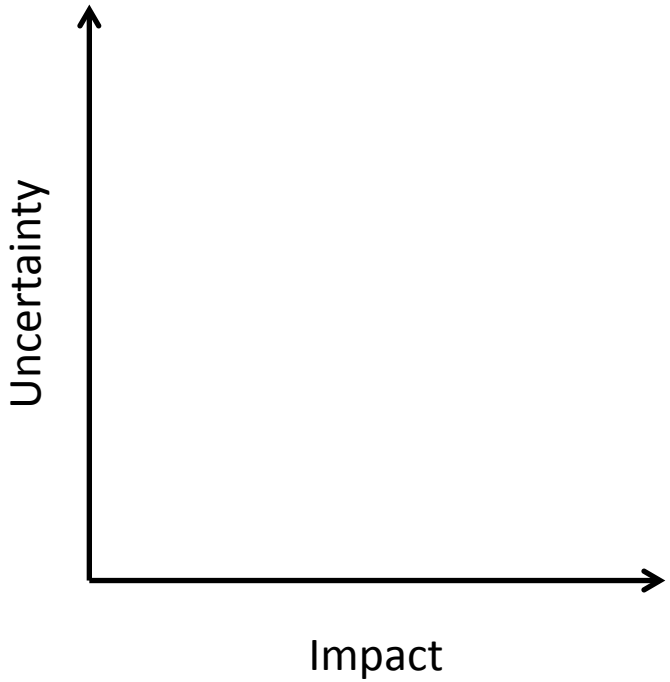


How is scenario planning done?

1. Identify and prioritize critical climate drivers
2. Select and define future scenarios
3. Evaluate potential impacts of future scenarios on focal resources
4. Identify potential adaptation options under each scenario

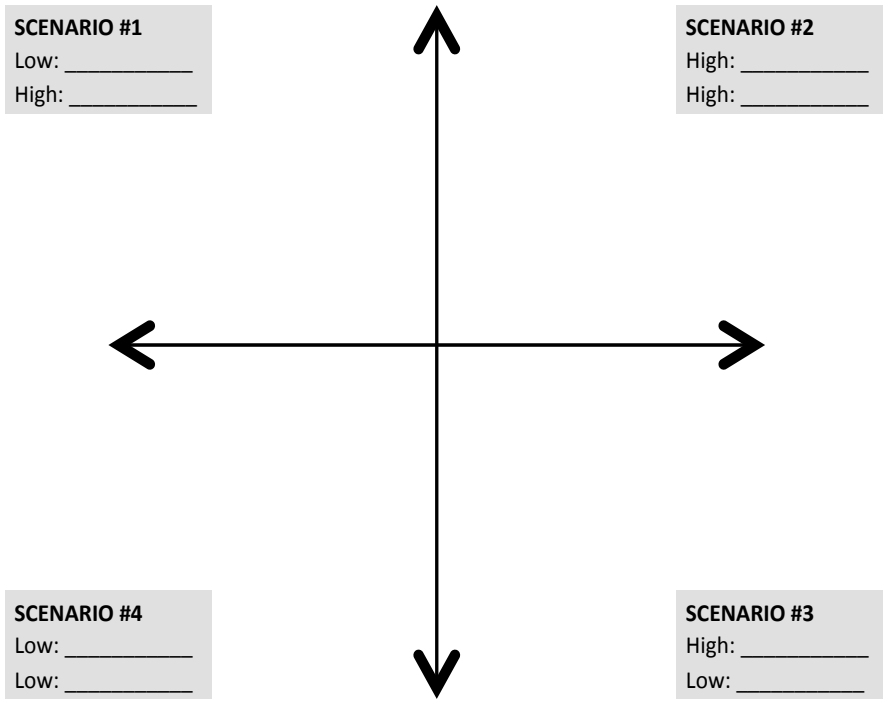
Process and Objectives

1. Compare *impact* and *uncertainty* of different climate drivers on focal resources



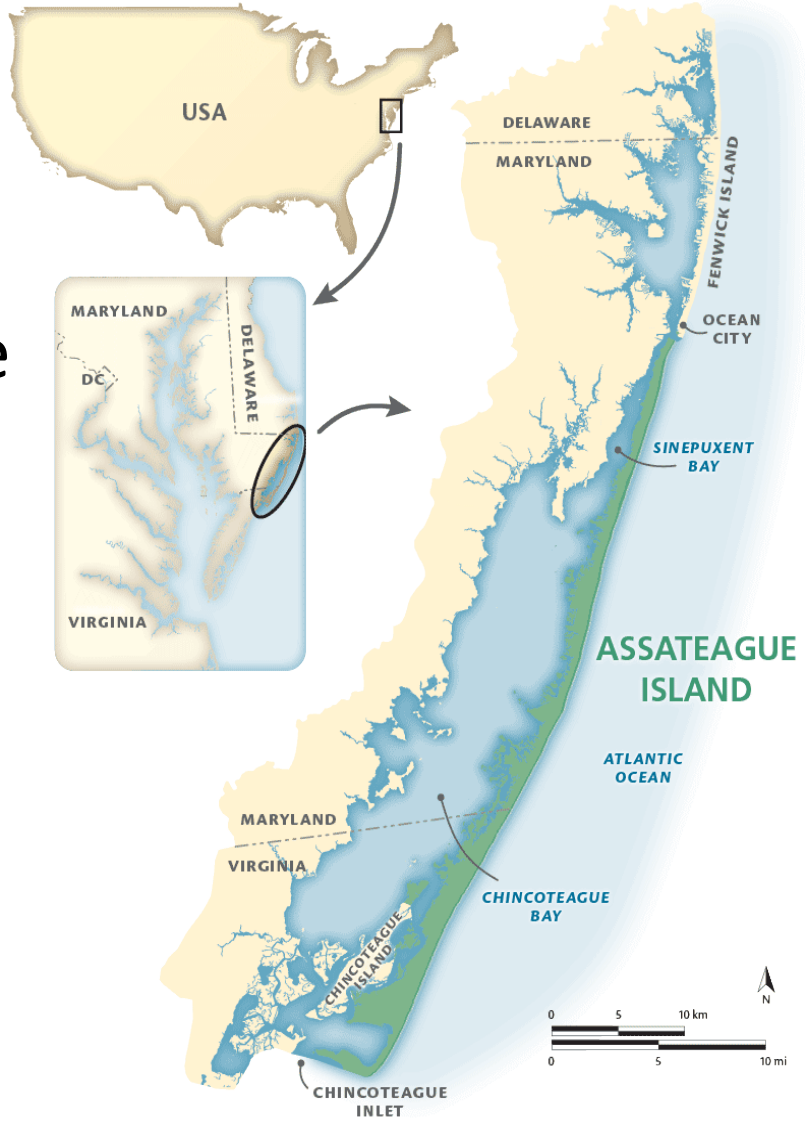
2. Select *two* key climate drivers

3. Create *four* scenarios and compare resource impacts across different futures



Scenario Planning at Assateague Island National Seashore

- Barrier island provides critical habitat for threatened species & buffer for mainland
- Three different agencies manage portions of Assateague Island: NPS, USFWS, State of Maryland
- High vulnerability to sea level rise and increased storms
- Many park neighbors were skeptical of future climate impacts and resistant to management changes



Assateague Scenario Planning

Key Resources:

Beaches/dunes
Salt marsh
Maritime Forest and shrub
Freshwater ponds
Piping plover
Wild pony
Red fox
Archeological Resources

Identify and prioritize critical climate drivers

Temperature

Sea level rise

Precipitation

Extreme Storms

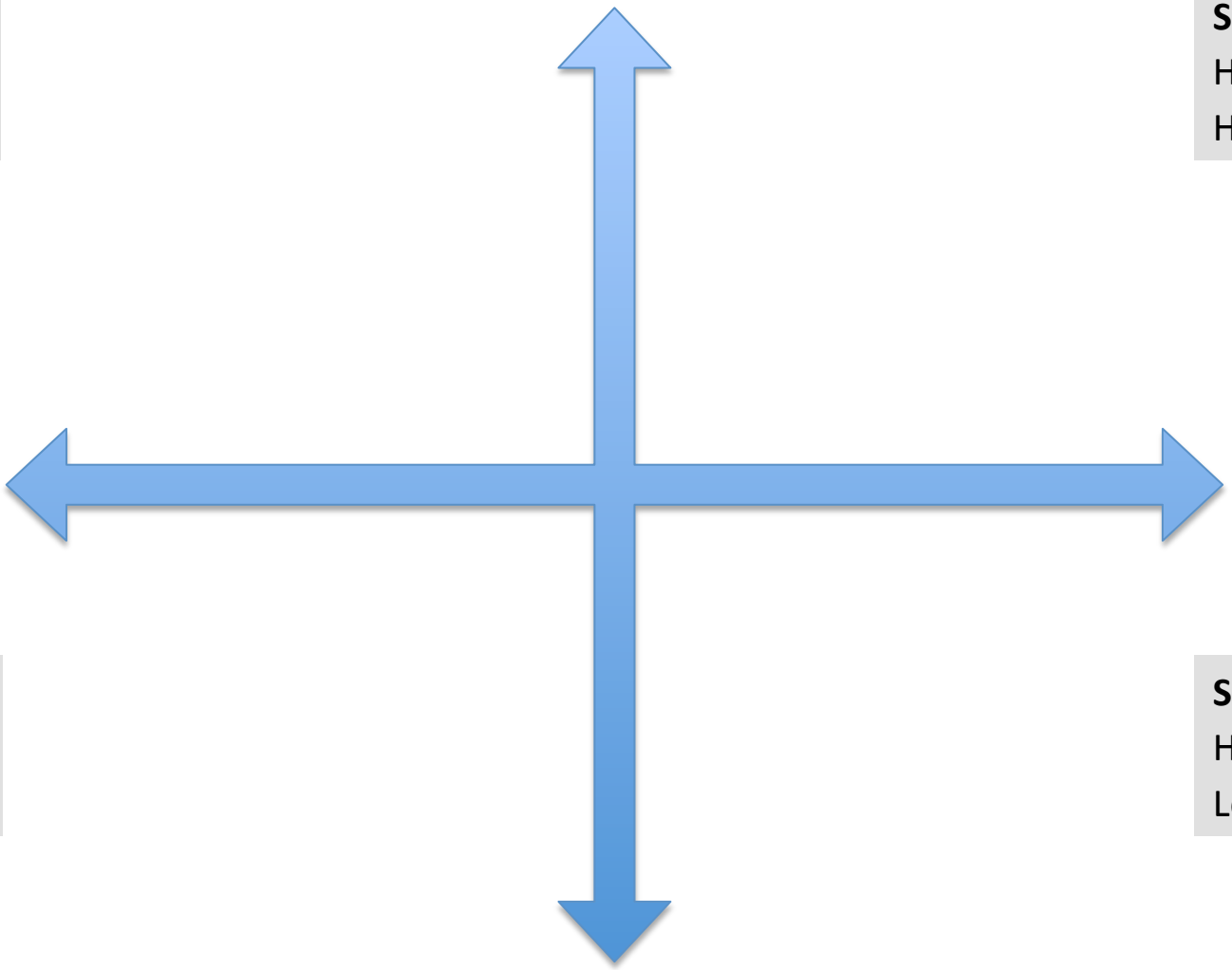
Drought

Assateague Island National Seashore

Select and define future scenarios

SCENARIO #1
Low: SLR
High: Storms

SCENARIO #2
High: SLR
High: Storms



SCENARIO #4
Low: SLR
Low: Storms

SCENARIO #3
High: SLR
Low: Storms

Assateague Island National Seashore

Evaluate impacts under future scenarios

SCENARIO #1
Low: SLR
High: Storms

Increasing temps
Increased storms & surge
High wave-driven overwash
Increased sediment runoff
Increased nutrient runoff and blooms
Saltwater intrusion ★

SCENARIO #2
High: SLR
High: Storms

Increasing temps
Increased storms & surge
High wave-driven overwash
Increased sediment runoff
Loss of land
Saltwater intrusion ★

SCENARIO #4
Low: SLR
Low: Storms

Increasing temps
Less precipitation
More frequent and prolonged droughts
Saltwater intrusion ★

SCENARIO #3
High: SLR
Low: Storms

Increasing temps
Loss of land
Less precipitation
Saltwater intrusion ★

Assateague Island National Seashore

Evaluate impacts on resources under future scenarios

SCENARIO #1
Low: SLR
High: Storms

- Beach & dune erosion
- Damage to maritime forest
- Degraded salt marsh habitat
- New space for shorebirds
- **Landward migration of barrier island**

SCENARIO #2
High: SLR
High: Storms

- Inlet formation/fragmentation
- Degradation/loss of salt marshes
- Loss of maritime forest
- Saltwater intrusion: shifts in plant types, loss of fw habitat
- **Landward migration of barrier island**

SCENARIO #4
Low: SLR
Low: Storms

- Some beach & dune erosion
- Lowering of water table/less freshwater available
- Degraded salt marsh habitat
- **Landward migration of barrier island**

SCENARIO #3
High: SLR
Low: Storms

- Degradation/loss of salt marshes
- Saltwater intrusion: shifts in plant types, loss of fw habitat
- **Landward migration of barrier island**

Assateague Island National Seashore

Evaluate impacts on resources under future scenarios

SCENARIO #1
Low: SLR
High: Storms

SCENARIO #2
High: SLR
High: Storms

SCENARIO #4
Low: SLR
Low: Storms

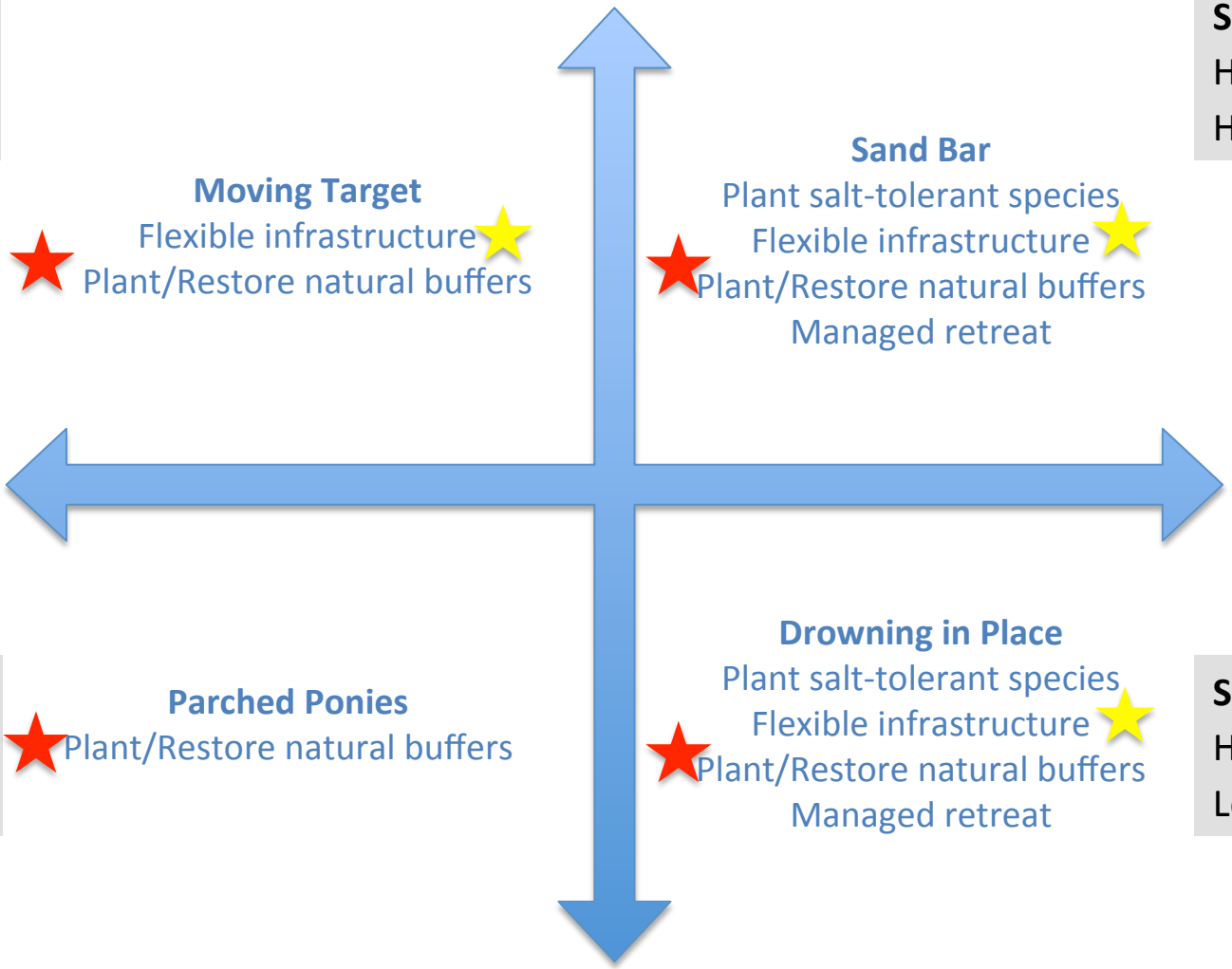
SCENARIO #3
High: SLR
Low: Storms

Assateague Island National Seashore

Identify potential adaptation options

SCENARIO #1
Low: SLR
High: Storms

SCENARIO #2
High: SLR
High: Storms



SCENARIO #4
Low: SLR
Low: Storms

SCENARIO #3
High: SLR
Low: Storms

Benefits of Scenario Planning

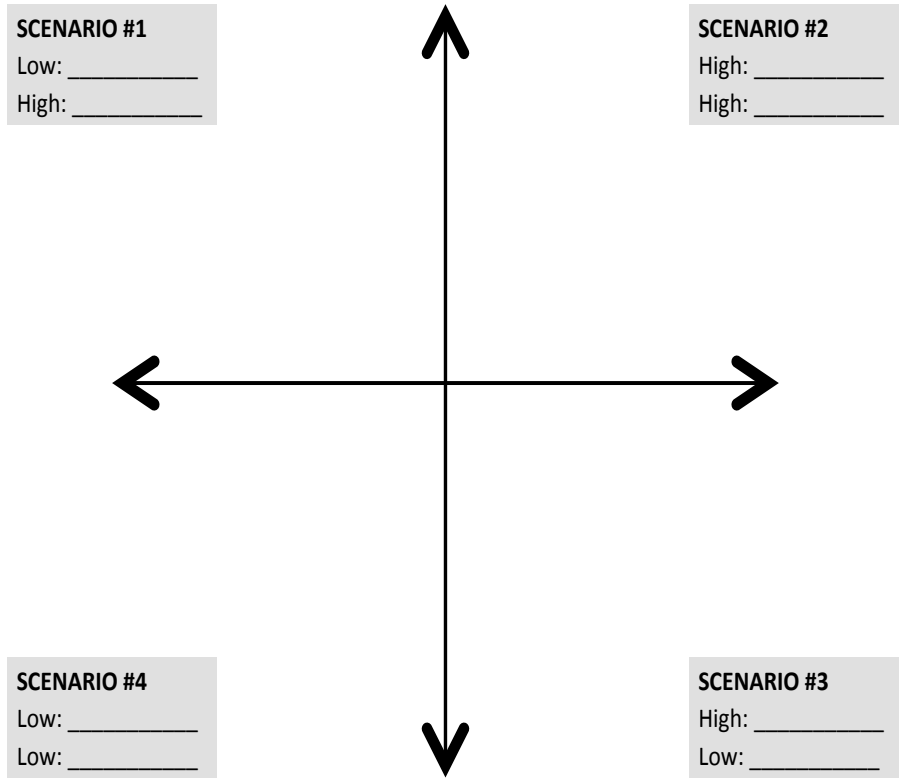
- Encourages thinking beyond historical trends
- Embraces uncertainty rather than ignoring it
- Identifies impacts to resources across different future climates
- Highlights adaptation strategies that apply across different future climates



Overview of Group Exercise

Desired Outcome: To define a suite of future climate scenarios and evaluate the impacts of different scenarios on focal resources

- Break out into your habitat groups
- Two parts:
  - Selecting climate drivers
  - Defining scenarios and evaluating impacts on focal resources



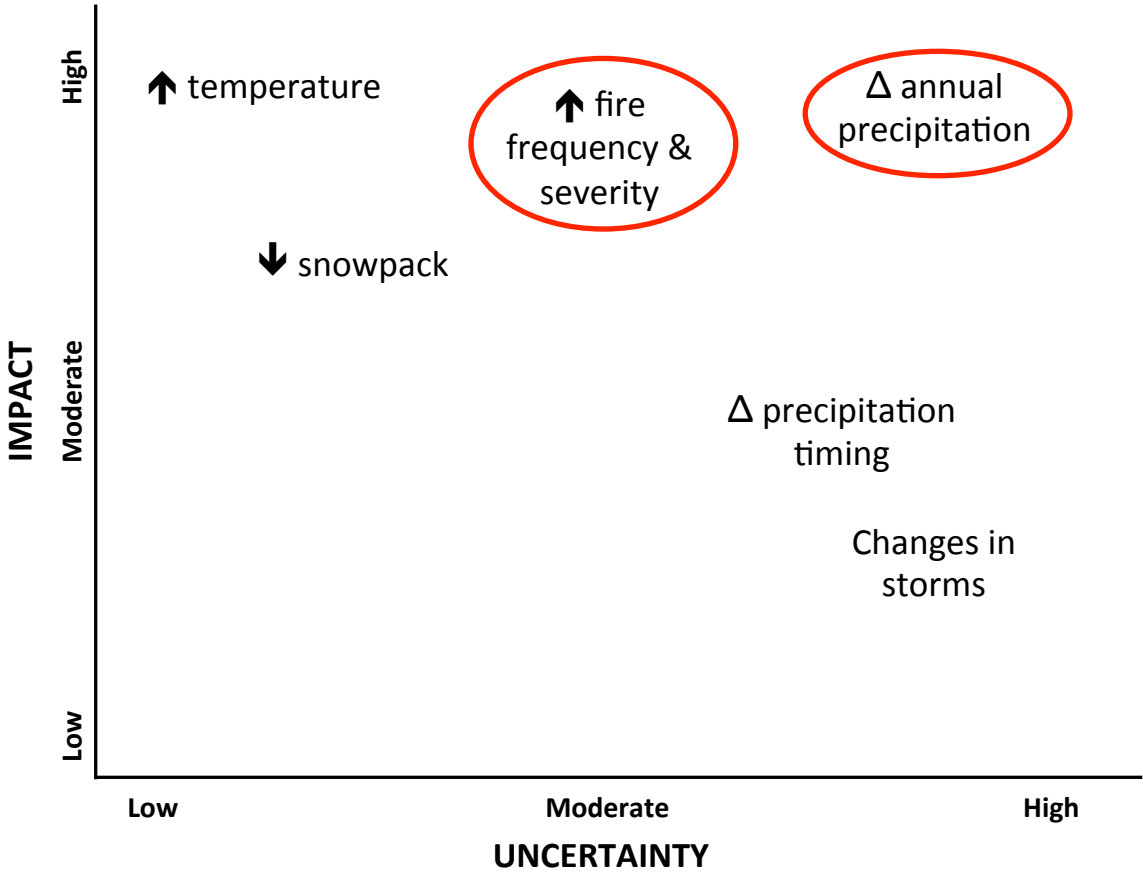
Overview of Group Exercise

Desired Outcome: To define a suite of future climate scenarios and evaluate the impacts of different scenarios on focal resources

Select climate drivers by:

A. Ranking each driver by its impact and uncertainty

B. Circling the **TOP 2** drivers that represent priorities for your focal resources*



***Often these are drivers with greater uncertainty and impact**

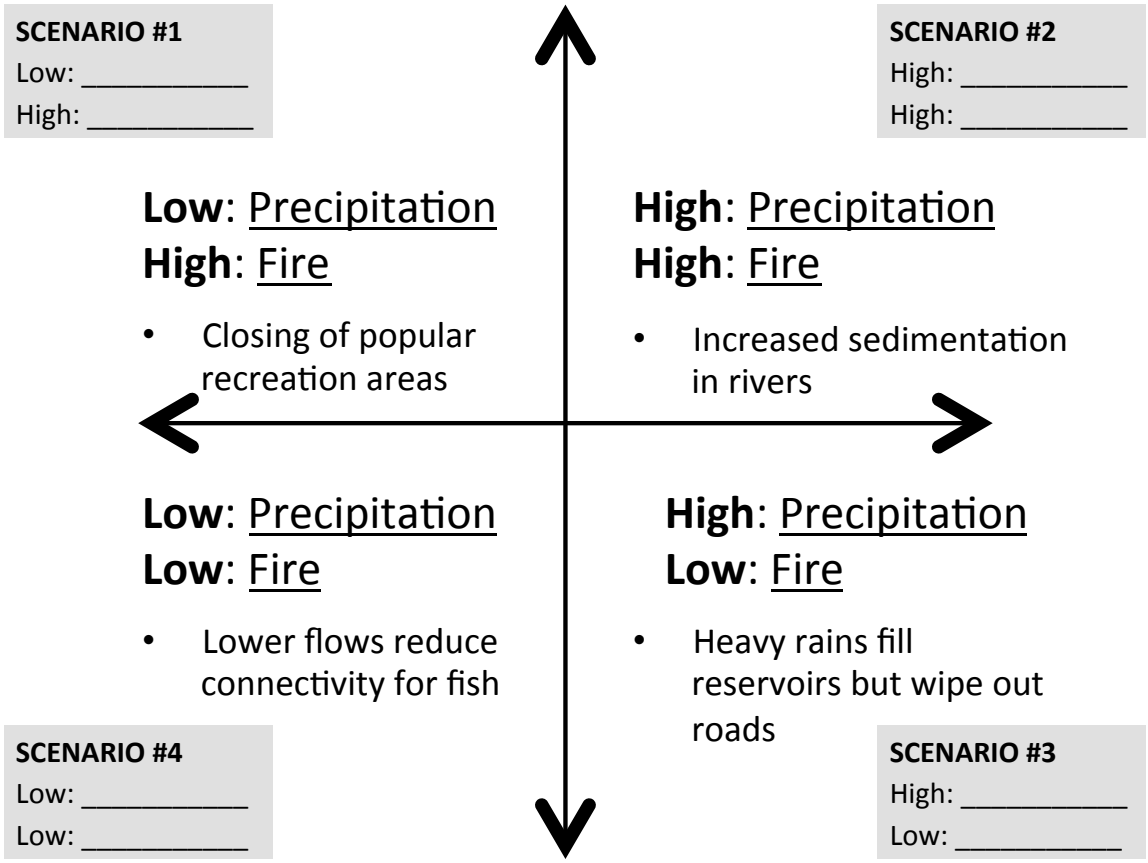
Overview of Group Exercise

Desired Outcome: To define a suite of future climate scenarios and evaluate the impacts of different scenarios on focal resources

Define scenarios and evaluate impacts by:

A. Identifying the opposite extremes of each scenario

B. Identifying the major impacts that would occur on your focal resources



Case Study: Scenario planning at TomKat Ranch

Alte

Wet and Wild!
Heavy rains and runoff cause erosion, threaten water quality.
Steelhead and redwoods persist.
More forage, better soil, but many ranch roads impassable.
LeftCoast thriving
Road through Pescadero flooded.
Thrush and abscesses cause problems for horses.

More rain

Less fog

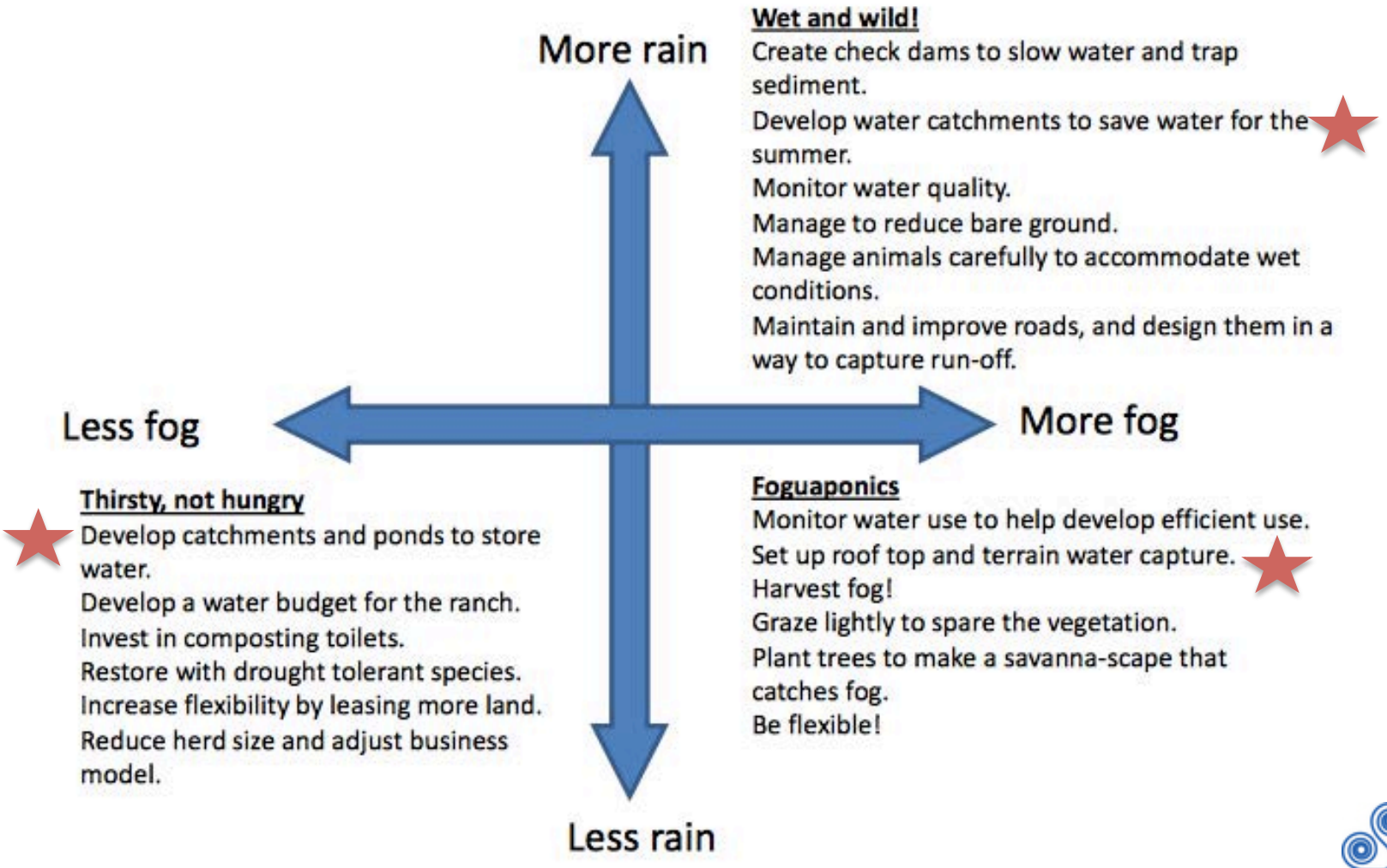
More fog

Less rain

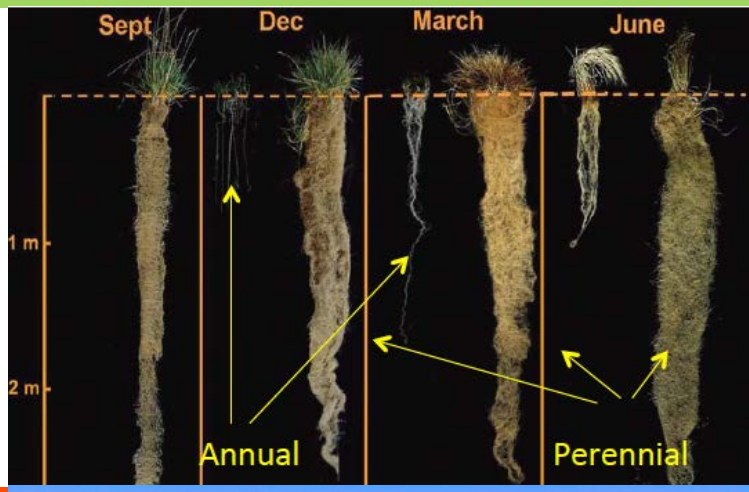
Thirsty, not hungry
Streams, wells, and springs go dry.
Redwoods and steelhead gone.
Grasslands productive, but depends on when the rain comes.
Roads in great shape.
Local ranchers compete for land.
Local farmers drill new wells to replace creek irrigation water.
More time and energy to move water to horses and cows.

Foguaponics
Streams, wells, and springs go dry.
Redwoods still here, steelhead gone.
Grasslands convert to coastal scrub.
Roads are in great shape.
Farmers focus on b-sprouts, artichokes and leeks.
No grass for horses, and hay is expensive.

Case Study: Scenario planning at TomKat Ranch



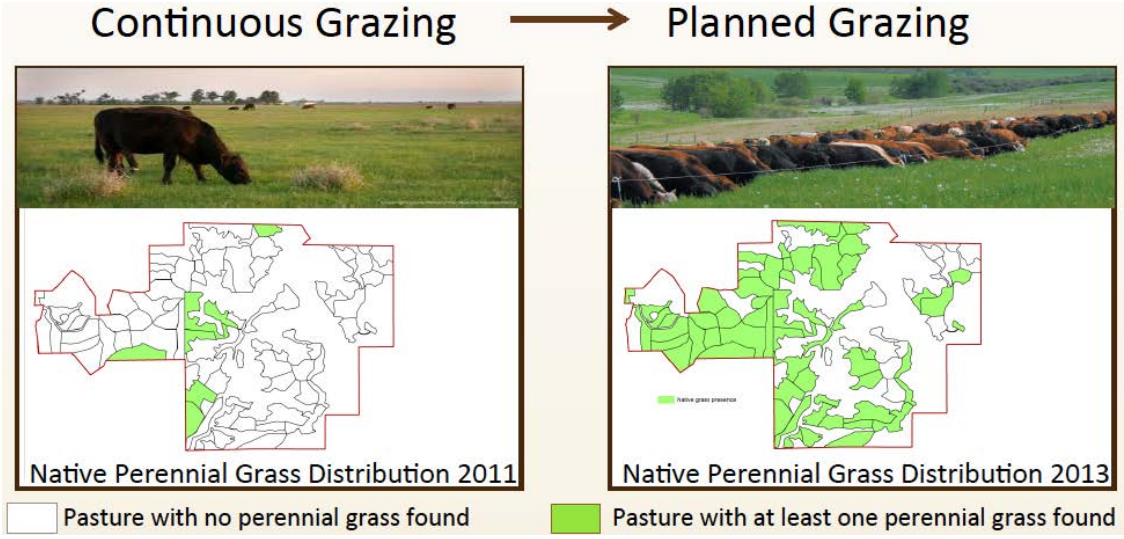
Climate-informed planning at TomKat Ranch



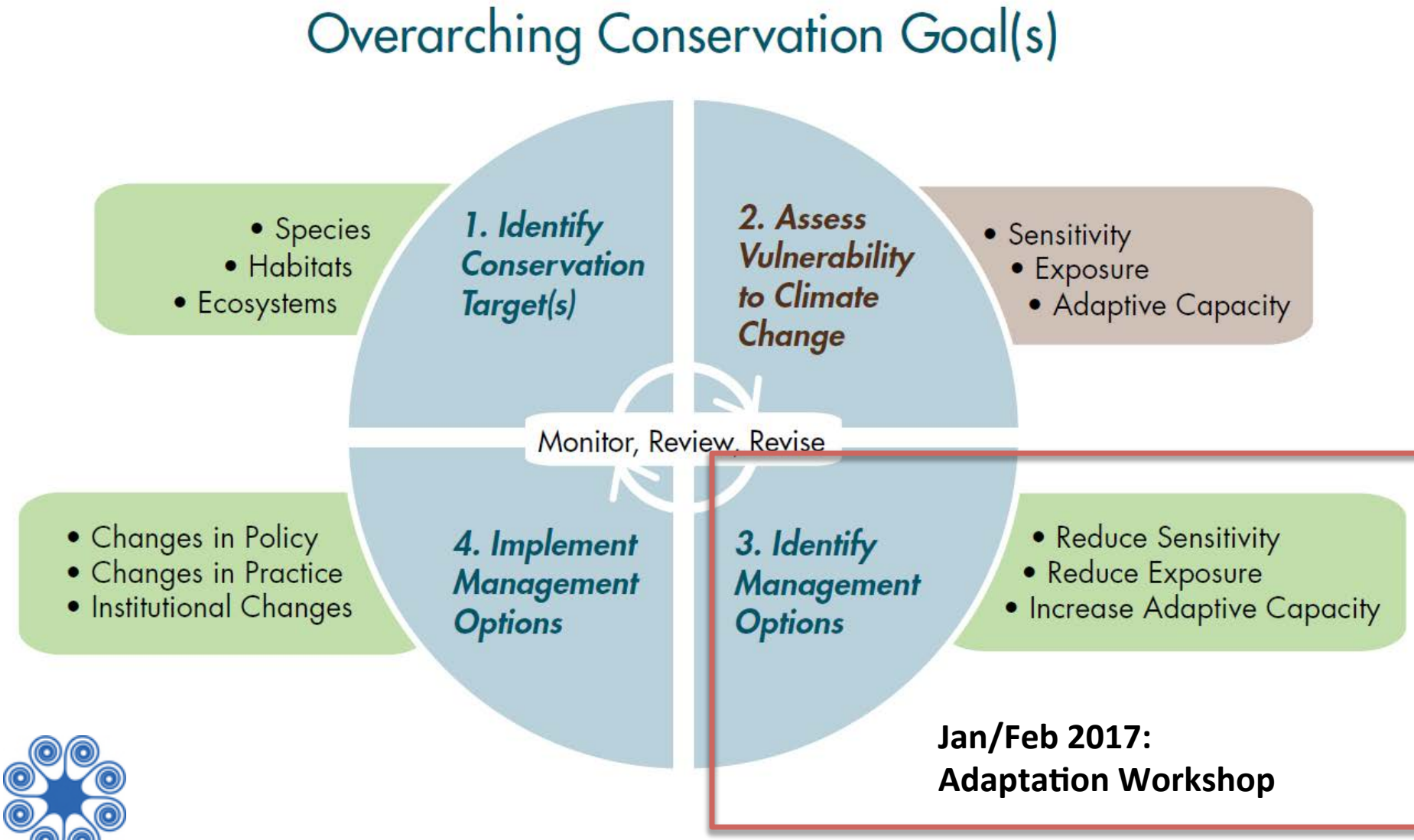
Altered Precipitation Patterns, ⬆Drought

Actions

- Undertaking water budget assessment
- Increasing cover of native perennial grasses
- Reducing need for supplemental animal feed
- Increasing locally grown food



Next Steps


Overarching Conservation Goal(s)
• Species
• Habitats
• Ecosystems
1. Identify Conservation Target(s)
2. Assess Vulnerability to Climate Change
• Sensitivity
• Exposure
• Adaptive Capacity
Monitor, Review, Revise
• Changes in Policy
• Changes in Practice
• Institutional Changes
4. Implement Management Options
3. Identify Management Options
• Reduce Sensitivity
• Reduce Exposure
• Increase Adaptive Capacity
Jan/Feb 2017:
Adaptation Workshop