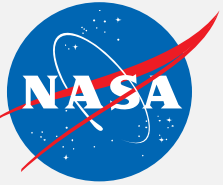




National Aeronautics and
Space Administration



ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

Introduction to Remote Sensing for Scenario- Based Ecoforecasting

Week 3: Overview of Scenario Planning

Brian W. Miller, Research Ecologist

U.S. Geological Survey, North Central Climate
Science Center



Gombe
National Park

Introduction

Overview of Scenario Planning

Introduction

We're bad at predicting the future



Image: [JMortonPhoto.com](https://www.JMortonPhoto.com) & [OtoGodfrey.com](https://www.OtoGodfrey.com), CC BY-SA 4.0



Image: Mike Licht from Washington, DC, USA (October 21, 2015) [CC BY 2.0], via Wikimedia Commons

Overview of Scenario Planning

Introduction



“The problem with television is that people must sit and keep their eyes glued on a screen; the average American family hasn’t time for it.”

-New York Times, 1939

Image: Paul Townsend from Bristol, UK - TV Shows We Used To Watch - 1955 Television advertising. Uploaded by [LongLiveRock](#), CC BY-SA 2.0

<http://www.elon.edu/e-web/predictions/150/1930.xhtml>

Overview of Scenario Planning

Introduction

“The Wall Street Journal once reviewed its own surveys of top economists’ predictions since 1982, and found that **the average “expert” correctly predicted the direction of interest rates (forget the magnitude) just 22 percent of the time,** which is considerably less accurate than a coin toss!”

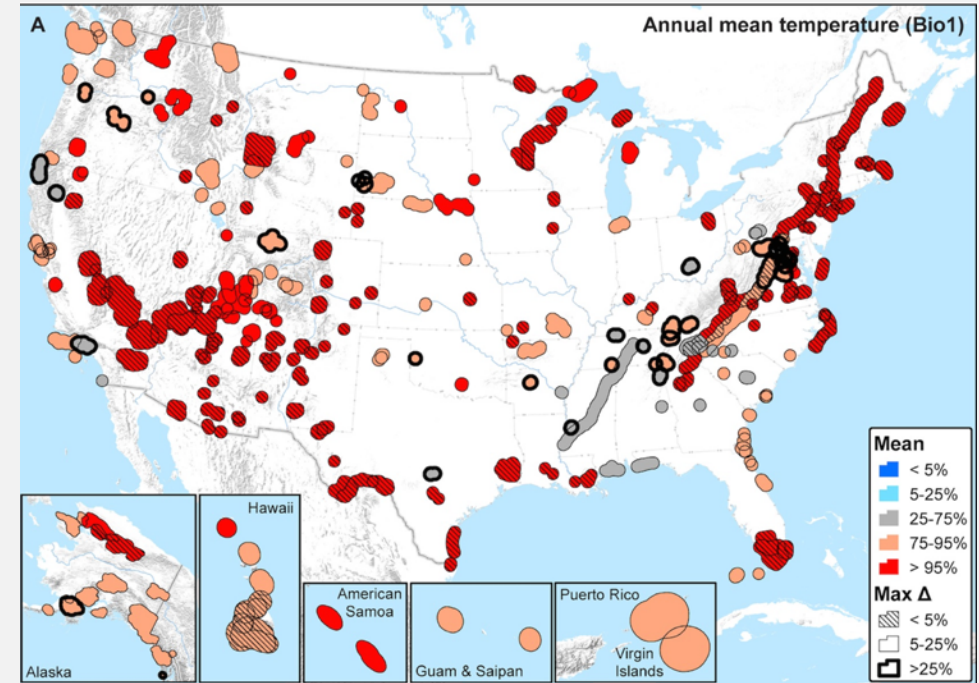
-Extreme Trust by Don Peppers & Marth Rogers

Image: <https://strategylab.ca/extreme-trust-honesty-as-a-competitive-advantage-11-quotes/extreme-trust-quotes-experts-predicting-the-direction-of-interest-rates-gif/>

Overview of Scenario Planning

Introduction

- Some changes are already happening
- And more changes are expected, with potentially dire consequences
- But there is uncertainty in projected changes and their impacts



81% (235 of 289) National Parks already face extreme temperatures
(past 10-30 years warmer than 95% of historical range of conditions)

Monahan, W.B. and Fisichelli, N.A., 2014. Climate exposure of US national parks in a new era of change. PLoS One, 9(7), p.e101302.

Overview of Scenario Planning

Introduction

- In a changing world with an uncertain future, how can we know what to do?
- What do you do when you're faced with making a decision, but are uncertain about the future?

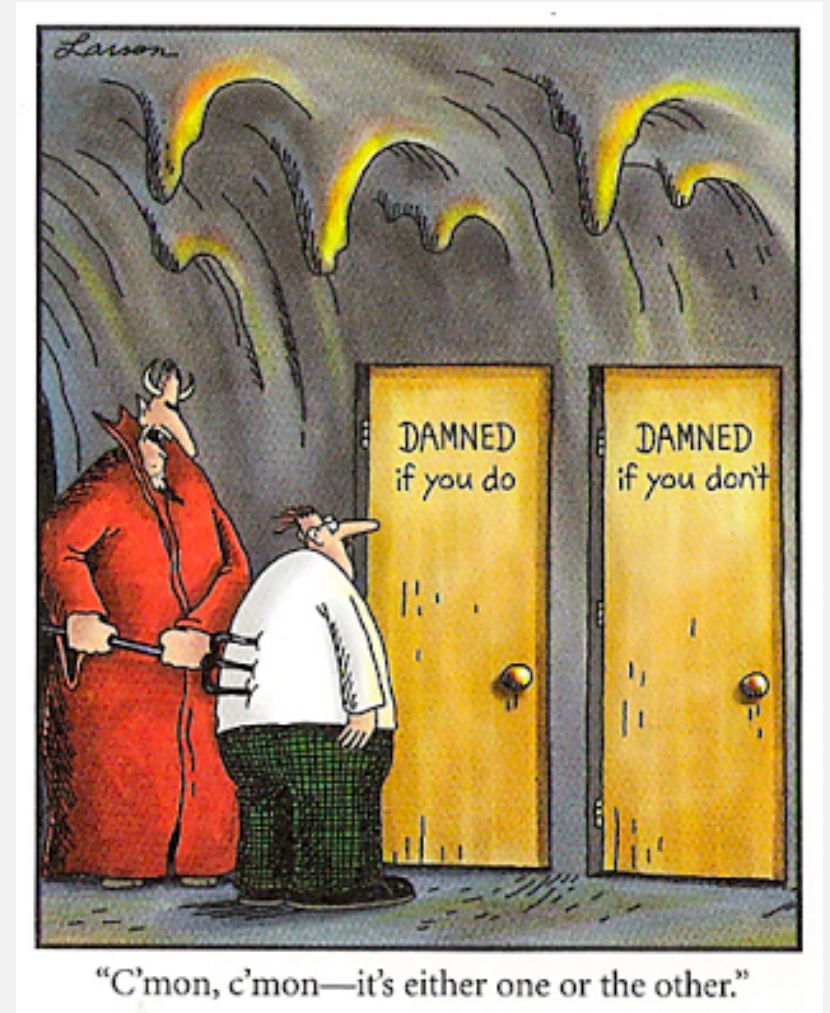


Image: Gary Larson

<http://allyduncan.blogspot.com/2009/09/daily-lol-far-side-damned-if-you-do.html>

Overview of Scenario Planning

Introduction

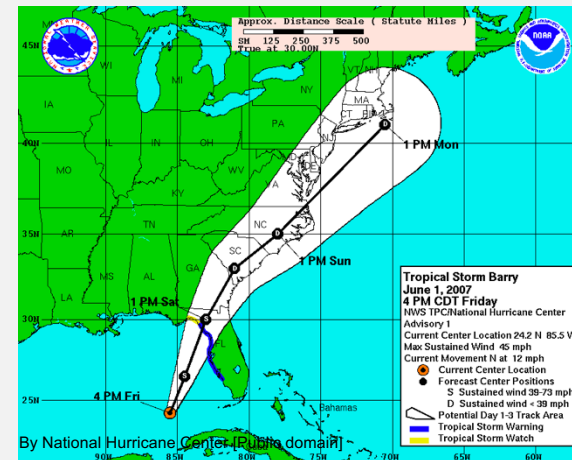
- Scenario planning!
 - We can't predict the future
 - But we can create informed plans that account for uncertainty
 - We use scenario planning (in one form or another) all the time!



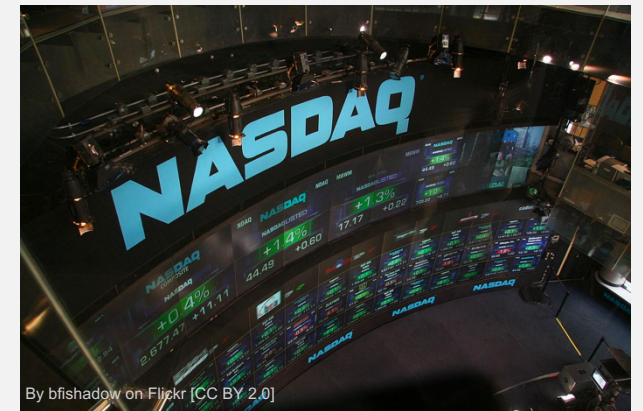
By Benne2 [CC BY-SA 3.0]



By Centers for Disease Control and Prevention [Public domain]



By National Hurricane Center [Public domain]



By bfshadow on Flickr [CC BY 2.0]

Images via Wikimedia Commons

Overview of Scenario Planning

Introduction

Scenario planning has proven useful in a variety of contexts



Images via Wikimedia Commons

Overview of Scenario Planning

Introduction



Credit: NASA

What are scenarios?

- “...stories about the ways that the world might turn out tomorrow...that can help us recognize and adapt to changing aspects of our current environment.”

–Peter Schwartz

The Art of the Long View: Planning for the Future in an Uncertain World, p. 3

Overview of Scenario Planning

Introduction

- Scenarios:
 - Offer a range of plausible future environments – not predictions
 - Provide a framework to support decisions under conditions that are uncertain and uncontrollable

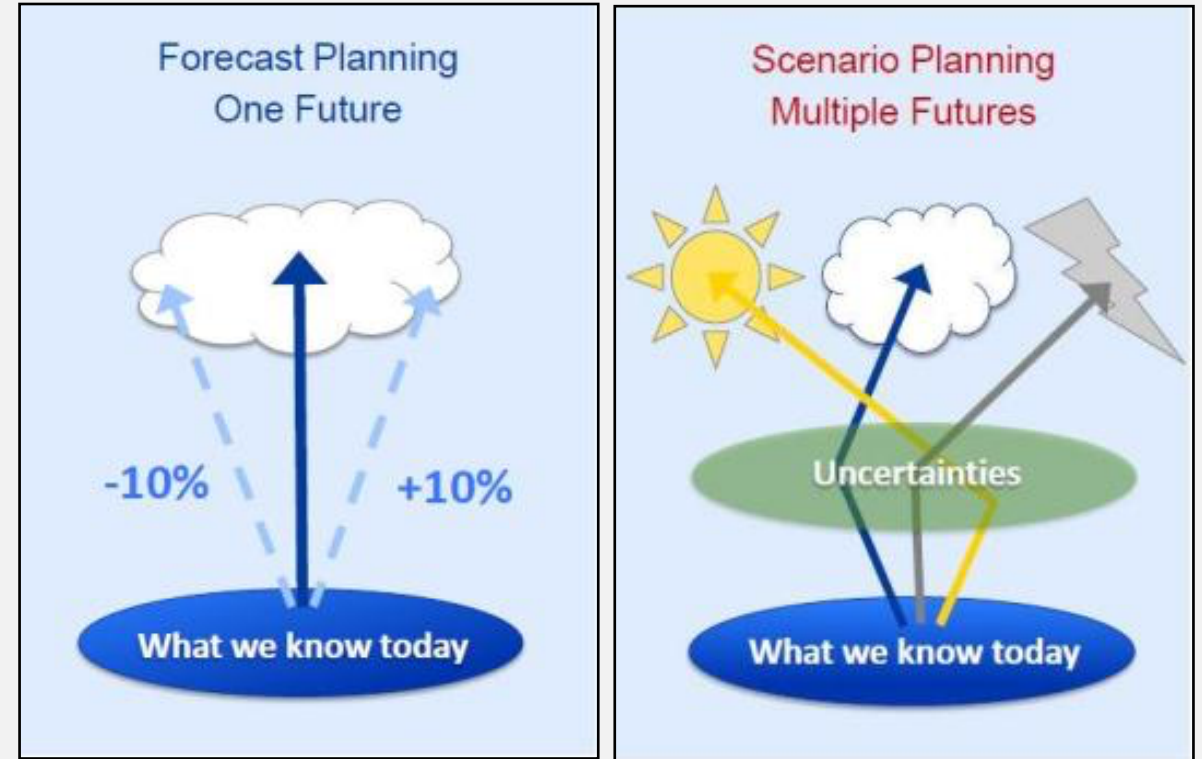


Image: Global Business Network

Overview of Scenario Planning

Introduction

Scenarios are NOT plans

“Plans are worthless. But planning is everything”

– U.S. President Eisenhower

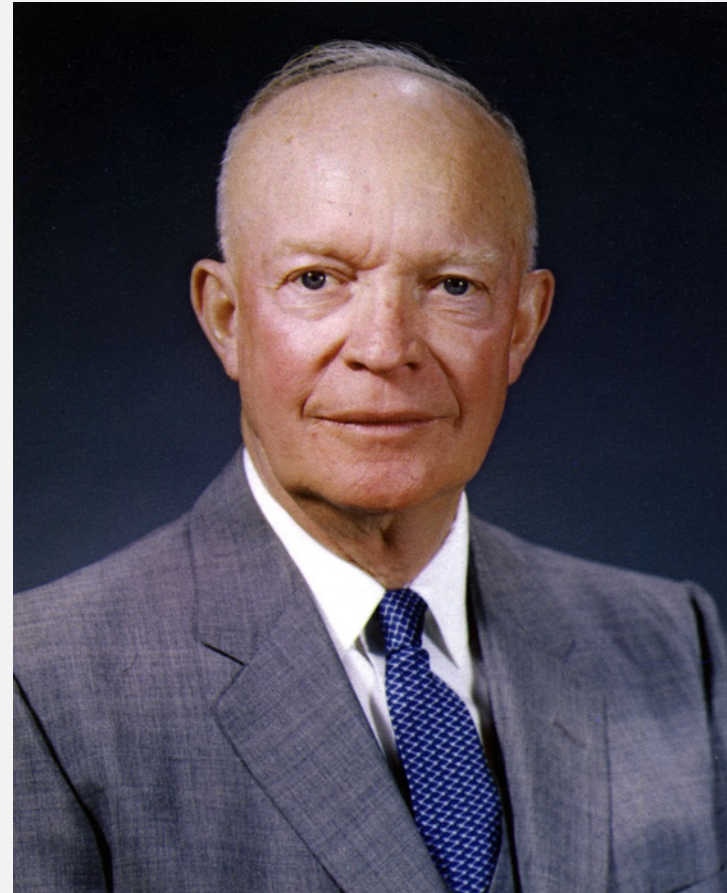
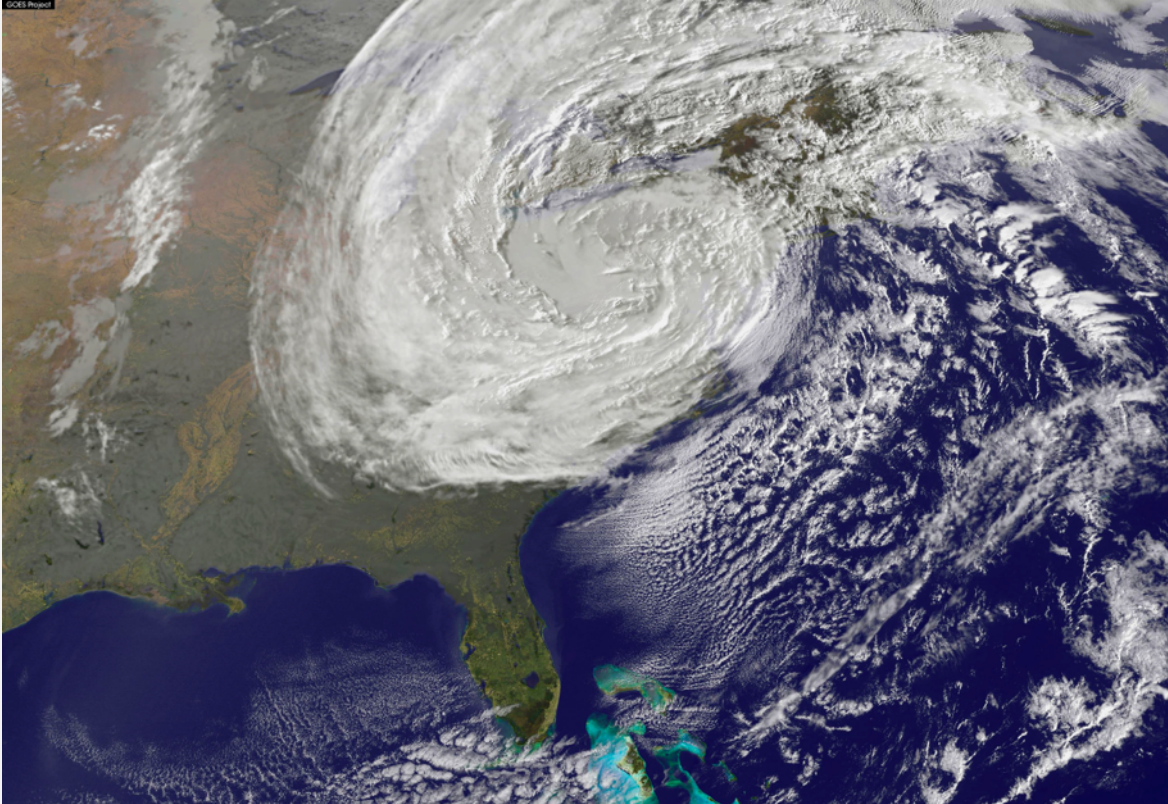


Image: <https://commons.wikimedia.org>

Overview of Scenario Planning

Introduction



Scenarios are not plans...

...but scenarios can come true

October 30, 2012

Image: <https://commons.wikimedia.org>

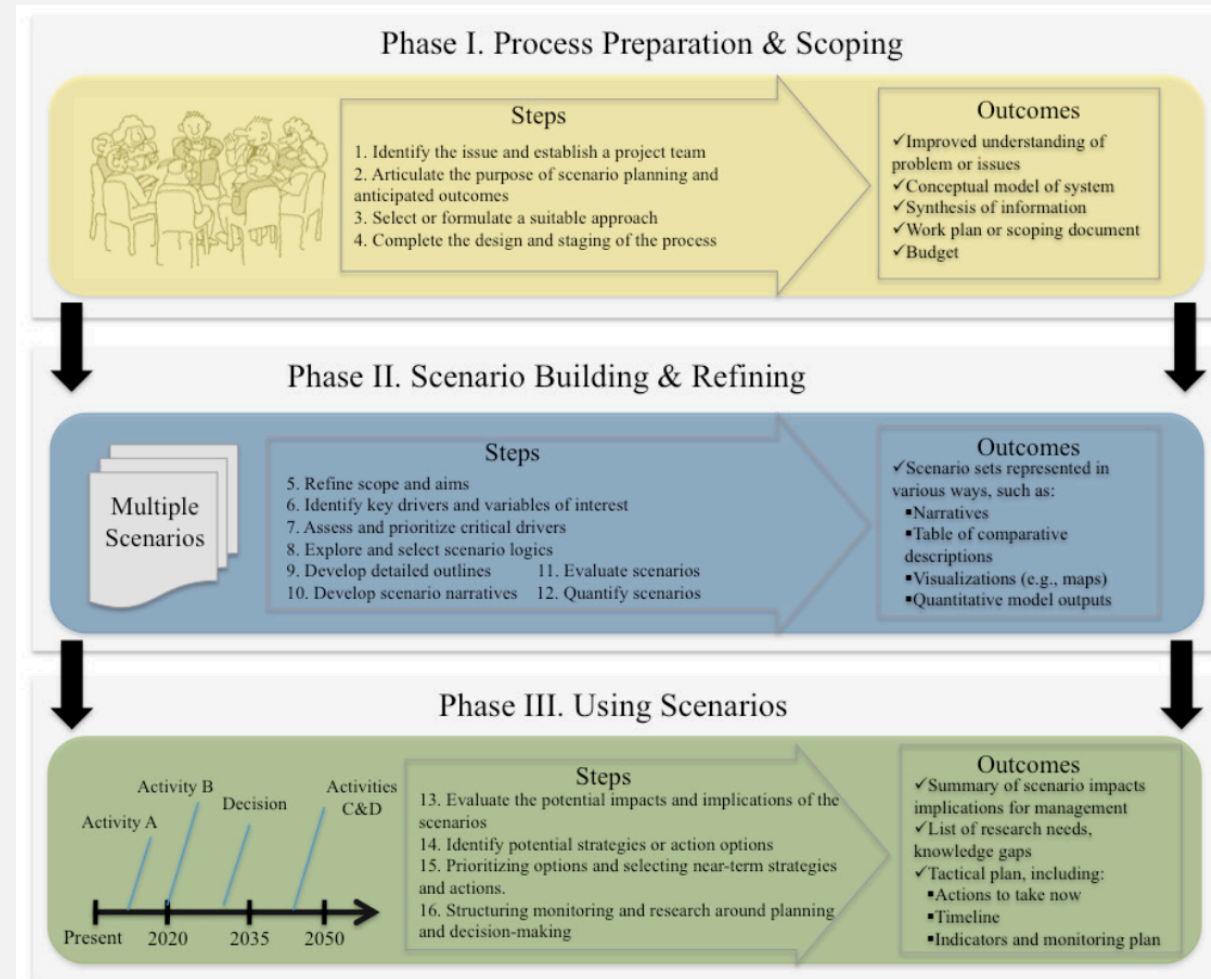


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Creating Scenarios

Overview of Scenario Planning

Creating Scenarios



Rowland, E.R., Cross, M.S., Hartmann, H. (2014) Considering Multiple Futures: Scenario Planning To Address Uncertainty in Natural Resource Conservation. Washington, DC: US Fish and Wildlife Service.

Overview of Scenario Planning

Creating Scenarios

Phases and Steps

A. Creating Scenarios

1. Identify key external drivers
2. Explore and select scenario logics

B. Applying Scenarios

3. Evaluate the potential impacts and implications of the scenarios
4. Identify potential strategies or action options

Rowland, E.R., Cross, M.S., Hartmann, H. (2014) Considering Multiple Futures: Scenario Planning To Address Uncertainty in Natural Resource Conservation. Washington, DC: US Fish and Wildlife Service.

Overview of Scenario Planning

Creating Scenarios

- What critical forces will affect the resources and operations in the future?

Overview of Scenario Planning

Creating Scenarios

- What critical forces will affect the resources and operations in the future?
 - Critical forces generally have both high impact and high uncertainty

Overview of Scenario Planning

Creating Scenarios

- What critical forces will affect the resources and operations in the future?
 - Critical forces generally have both high impact and high uncertainty

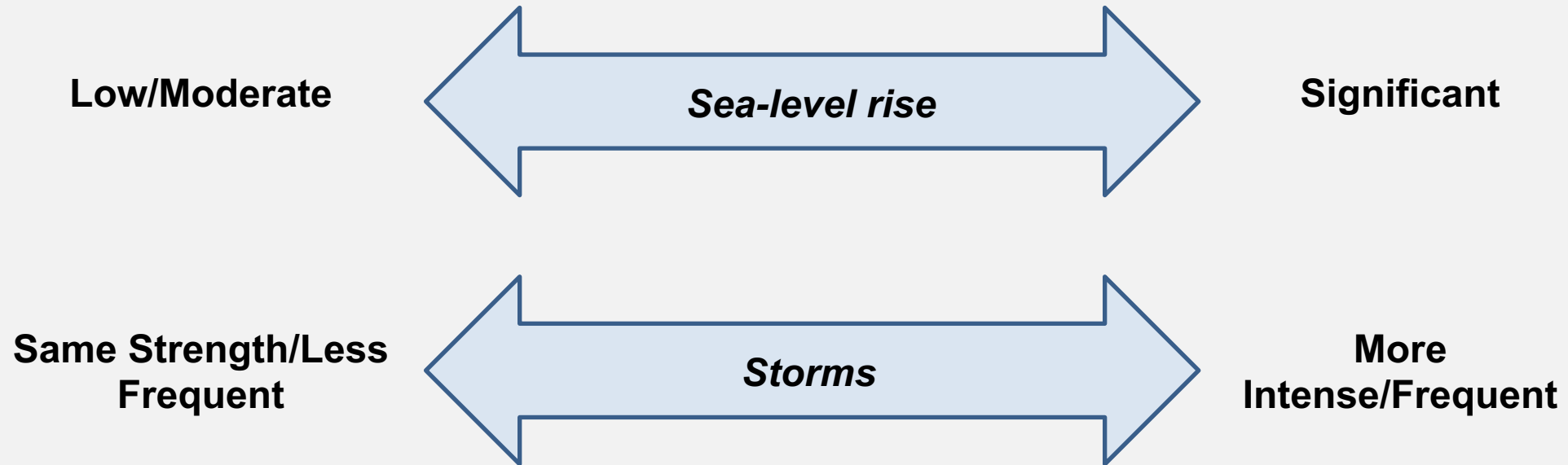


Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Creating Scenarios

- What critical forces will affect the resources and operations in the future?
 - Critical forces generally have both high impact and high uncertainty



Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Creating Scenarios

- Dune erosion & overwash ↑
- Island size ↓; estuary ↑
- High infrastructure impacts

- Dynamic barrier island but with more intense pressure than in the past
- Island size ↓; estuary ↑

More Intense/Frequent

Low/Moderate

Sea-level

Storms

rise

Significant

- Fragmentation: island → sand bar
- High impacts to aquatic, terrestrial, & salt marshes

Same Strength/Less Frequent

- Islands are smaller and shift toward land
- Saltwater intrusion (widespread)

Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Creating Scenarios

Moving Target

- Dune erosion & overwash ↑
- Island size ↓; estuary ↑
- High infrastructure impacts

Shifting Sands

- Dynamic barrier island but with more intense pressure than in the past
- Island size ↓; estuary ↑

More Intense/Frequent

Sand Bar

- Fragmentation: island → sand bar
- High impacts to aquatic, terrestrial, & salt marshes

Low/Moderate

Sea-level

rise

Significant

Storms

Drowning Island

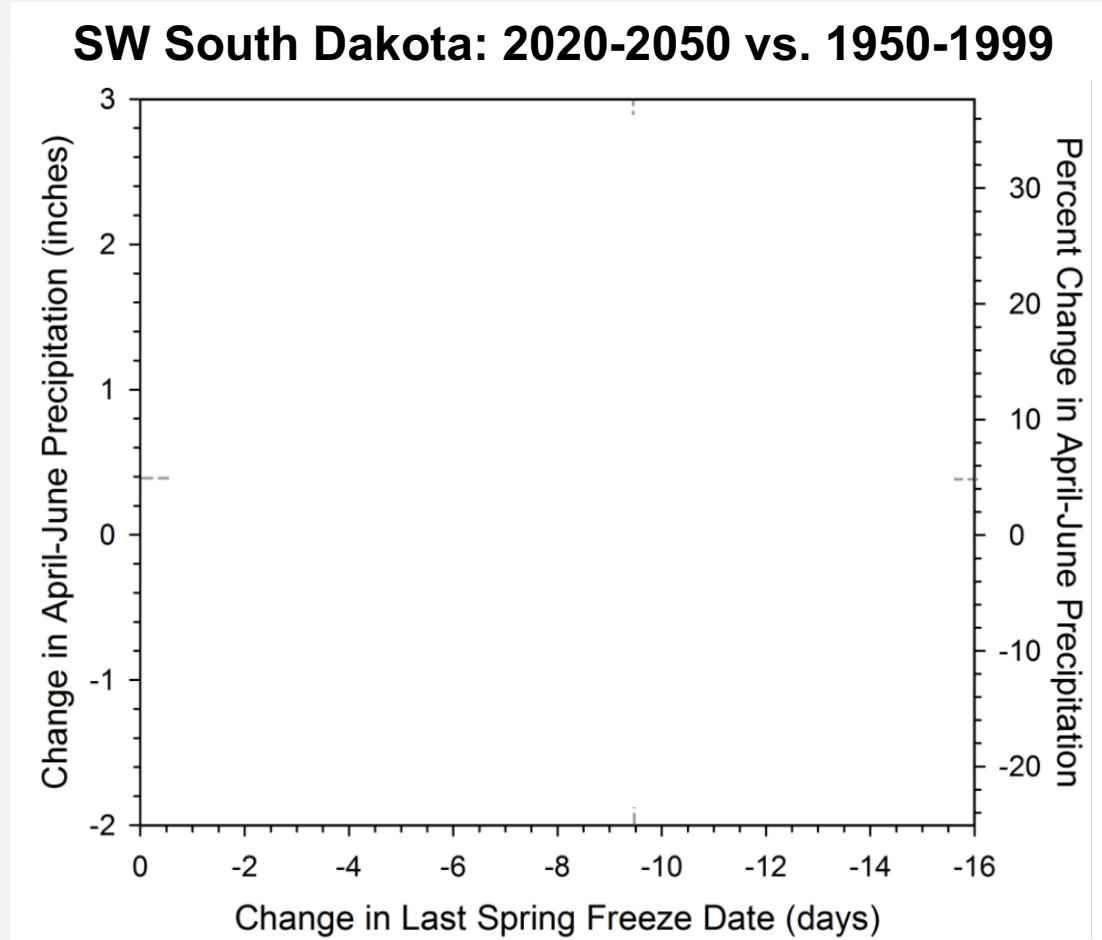
- Islands are smaller and shift toward land
- Saltwater intrusion (widespread)

Same Strength/Less Frequent

Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

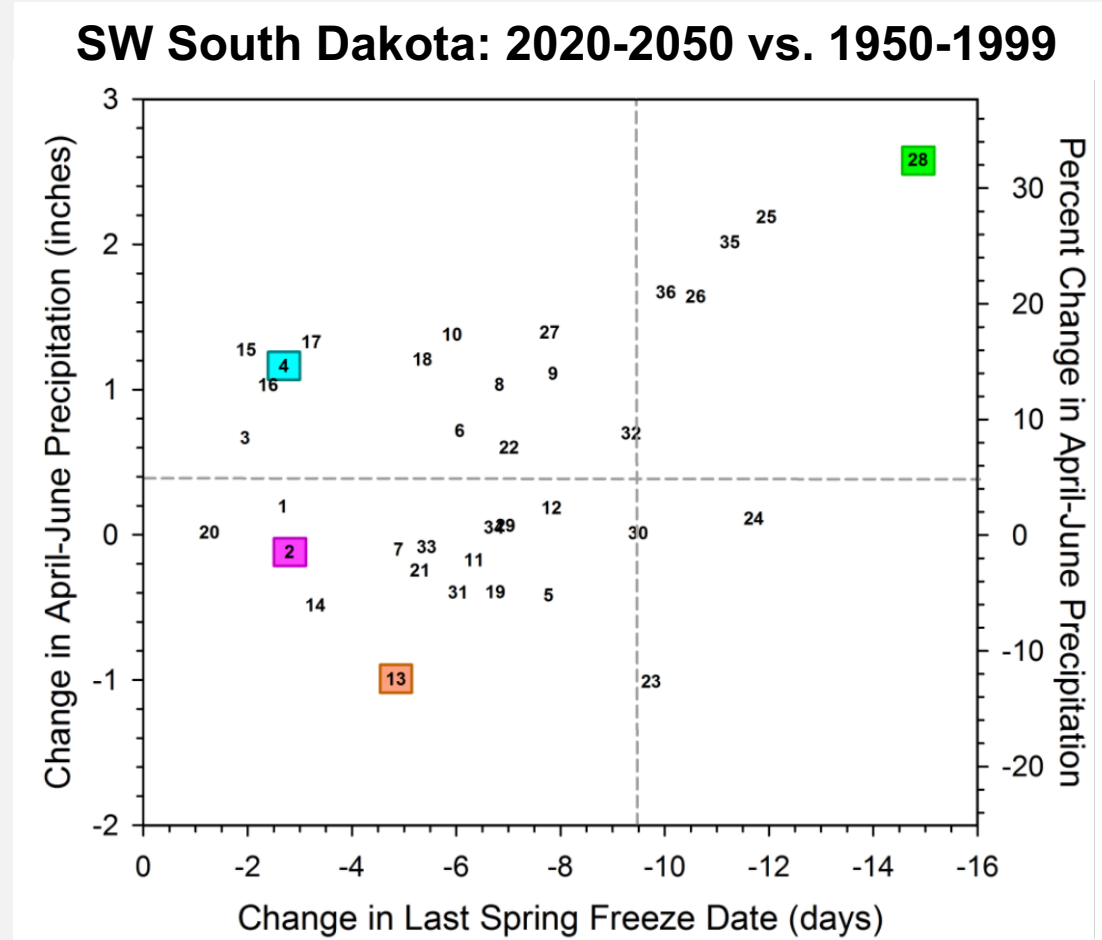
Creating Scenarios



Fisichelli, N.A., Schuurman, G.W., Symstad, A., Ray, A., Miller, B., Cross, M., Rowland, E., 2016. Resource management and operations in southwest South Dakota: Climate change scenario planning workshop summary January 20-21, 2016, Rapid City, SD. Natural Resource Report. Report No. NPS/NRSS/NRR—2016/1289

Overview of Scenario Planning

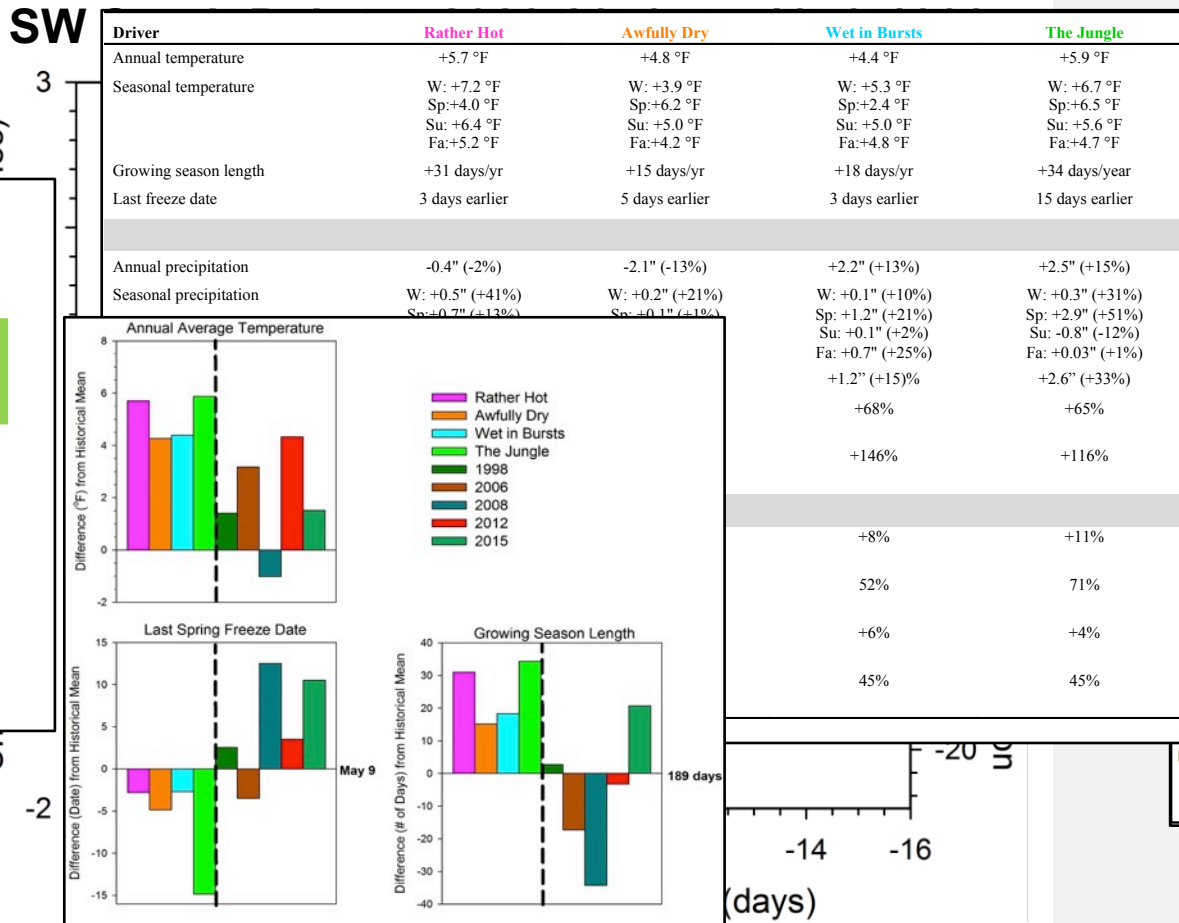
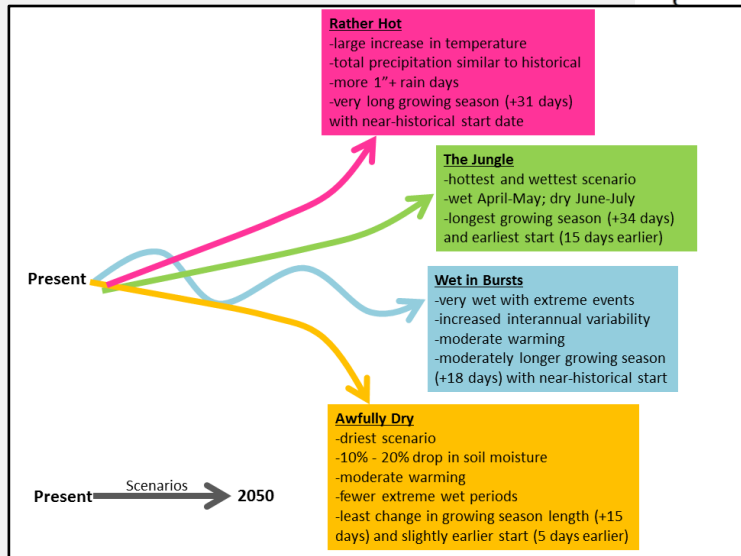
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Overview of Scenario Planning

Creating Scenarios



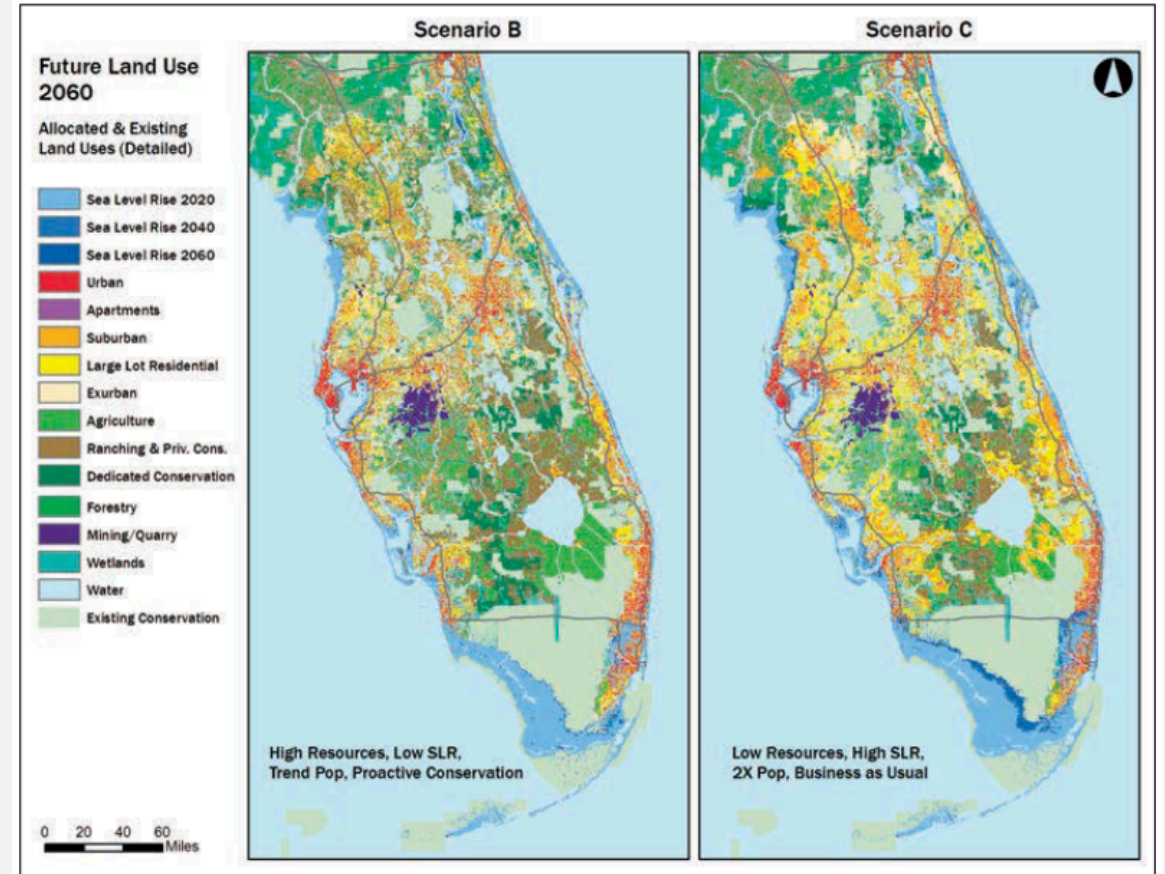
Climate Driver	Rather Hot	Awfully Dry	Wet in Bursts	The Jungle
Temperature	↑	↑	↑	↑
Last spring freeze date	↔	↑	↔	↑
April-June precipitation	↔	↓	↑	↑
Spring-Summer soil moisture	↔	↓	↑	↑
One-day heavy rain events	↑	↔	↑	↑
Five-day heavy rain events	↔	↓	↑	↑

Fisichelli, N.A., Schuurman, G.W., Symstad, A., Ray, A., Miller, B., Cross, M., Rowland, E., 2016. Resource management and operations in southwest South Dakota: Climate change scenario planning workshop summary January 20-21, 2016, Rapid City, SD. Natural Resource Report. Report No. NPS/NRSS/NRR—2016/1289

Overview of Scenario Planning

Creating Scenarios

- Drivers of Change & Remote Sensing
 - Sea Level Rise & Elevation
 - Human population growth
 - Infrastructure and zoning
 - Demographics
 - Land use
 - Attractiveness for conservation, ag, dev.



Vargas-Moreno and Flaxman. 2014. land use and climate change scenarios for the pensinsular florida landscape conservation cooperative, In: Rowland, E.R., Cross, M.S., Hartmann, H. (2014) Considering Multiple Futures: Scenario Planning to Address Uncertainty in Natural Resource Conservation. Washington, DC: US Fish and Wildlife Service.

Overview of Scenario Planning

Creating Scenarios

- Scenarios should be:
 - **Plausible** – believable, realistic
 - **Challenging** – provocative, thought-provoking
 - **Relevant** – significant and demonstrable
 - **Divergent** – different from each other

Source: National Park Service. 2013. Using Scenarios to Explore Climate Change: A Handbook for Practitioners. National Park Service Climate Change Response Program.

Overview of Scenario Planning

Creating Scenarios

- All scenarios have “good” and “bad” parts
- Characters
- Plot lines:
 - Winners/losers
 - Crisis/response



Gombe
National Park

Applying Scenarios

Overview of Scenario Planning

Applying Scenarios

- Scenario Implications and Responses
 - Effects to resources, facilities, and infrastructure
 - Management responses



Photos: G. Schuurman

Overview of Scenario Planning

Applying Scenarios

- Scenario Implications
 - Effects to various resources
 - Indirect effects
 - Mixed groups



Photo: G. Schuurman

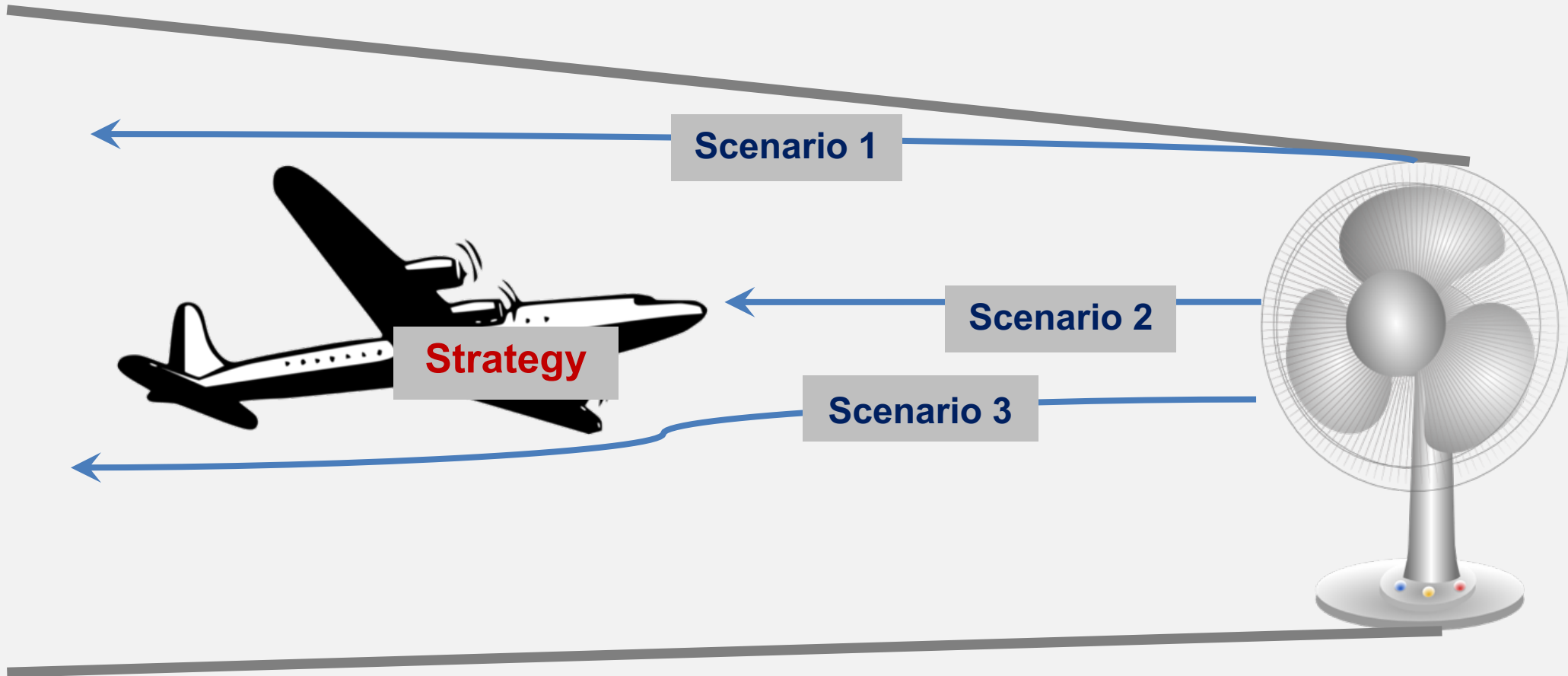
Overview of Scenario Planning

Applying Scenarios

- Management responses
 - Testing decisions and options
 - Wind tunneling
 - For each scenario:
 - Is the strategy well-positioned to succeed if the world turns out like this?
 - What aspects of the strategy will need to be kept in place?
 - What aspects of the strategy will need to change?
 - In what ways?

Overview of Scenario Planning

Applying Scenarios



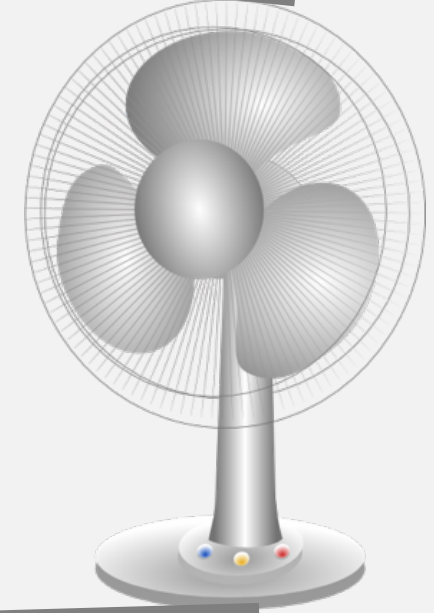
Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Applying Scenarios



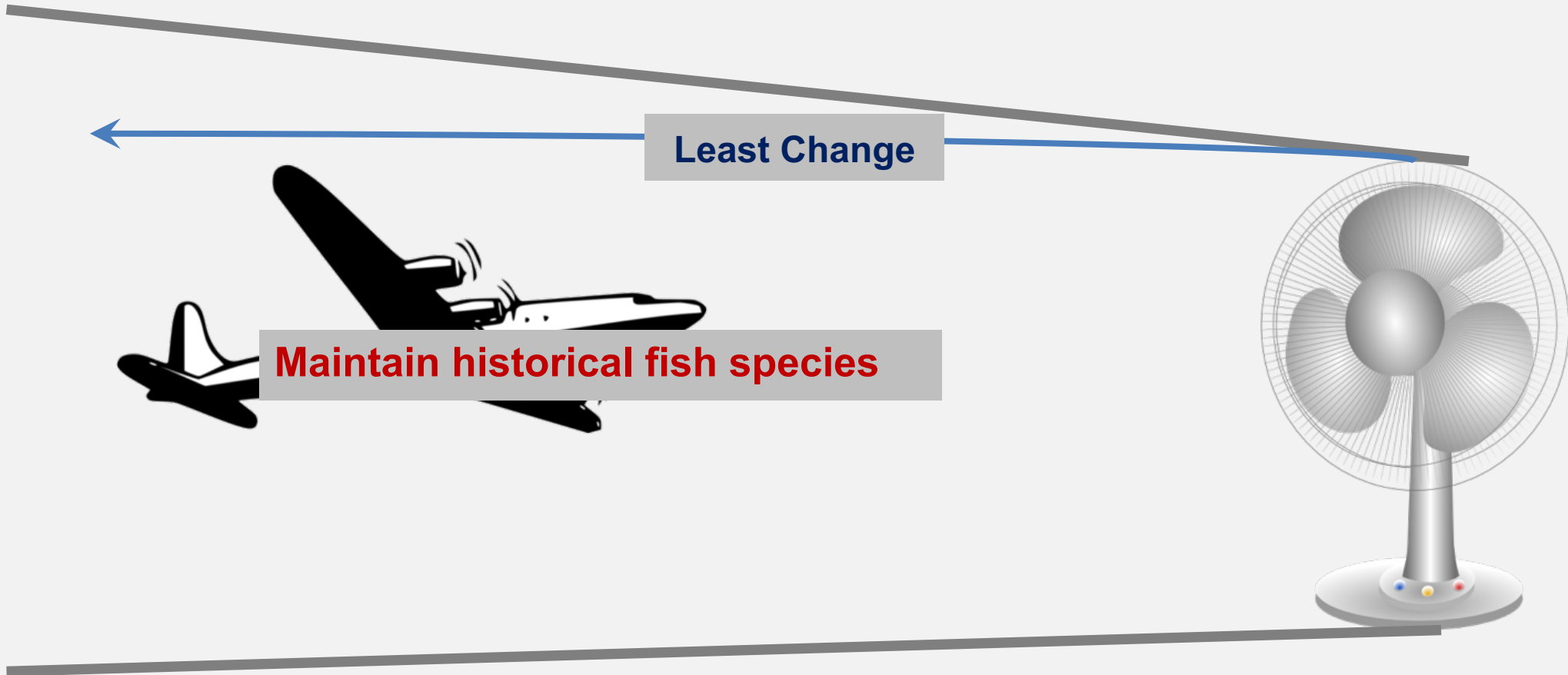
Maintain historical fish species



Graphic: Modified from NPS Climate Change Response Program

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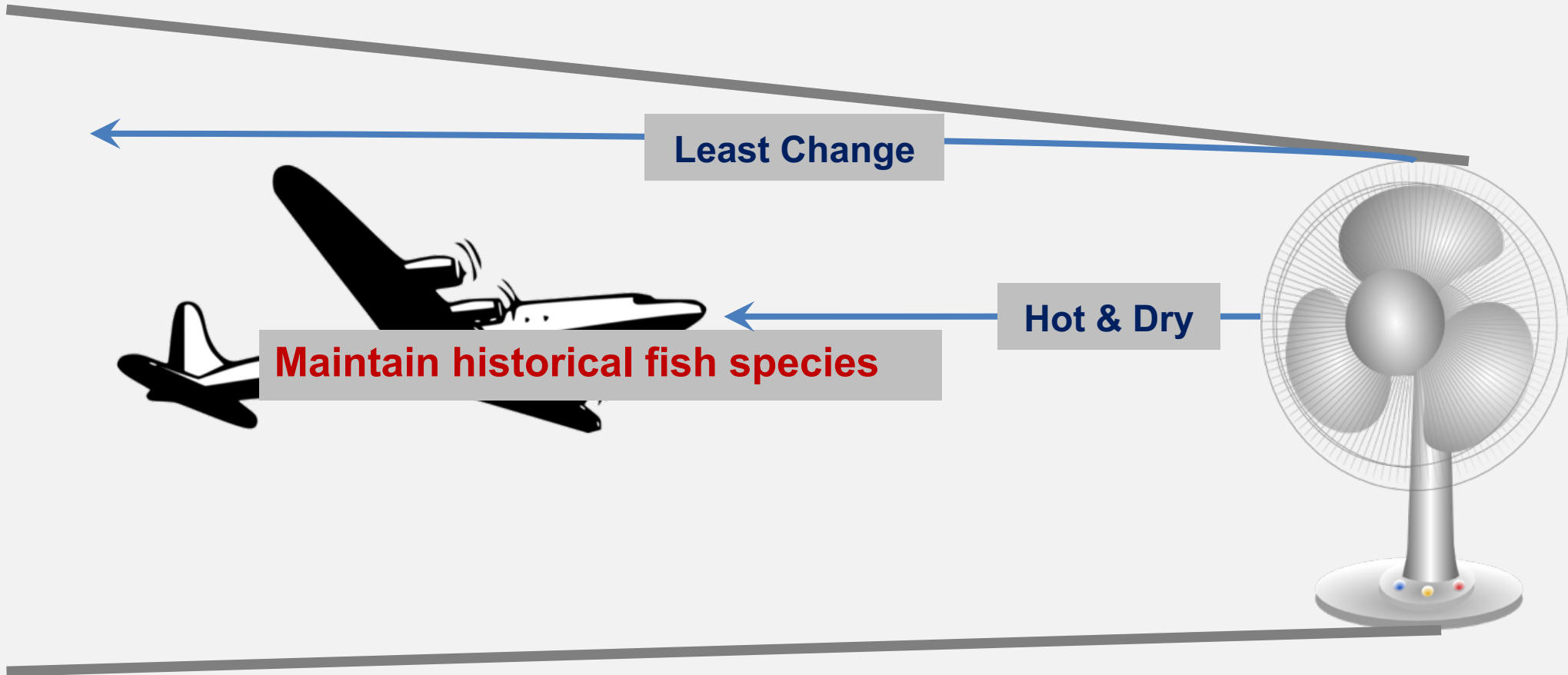
Applying Scenarios



Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

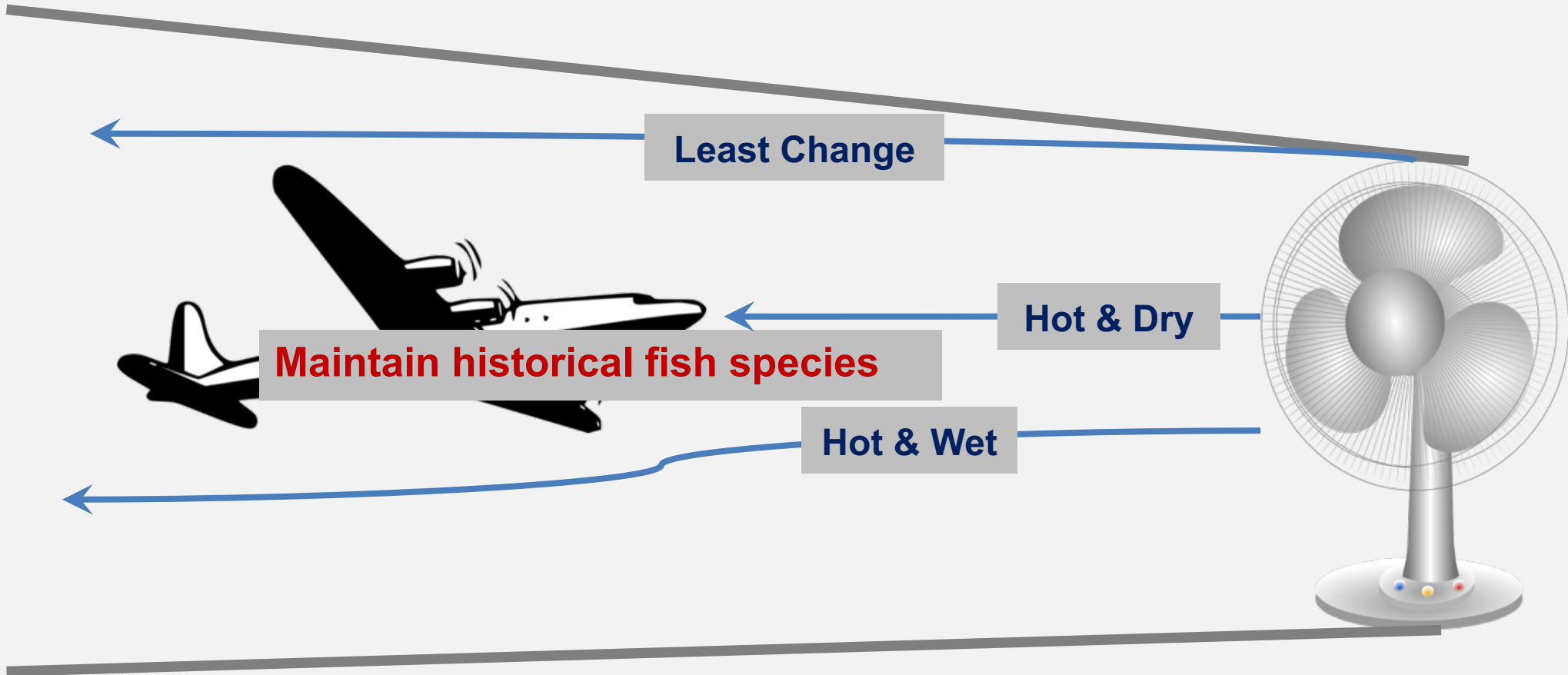
Applying Scenarios



Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

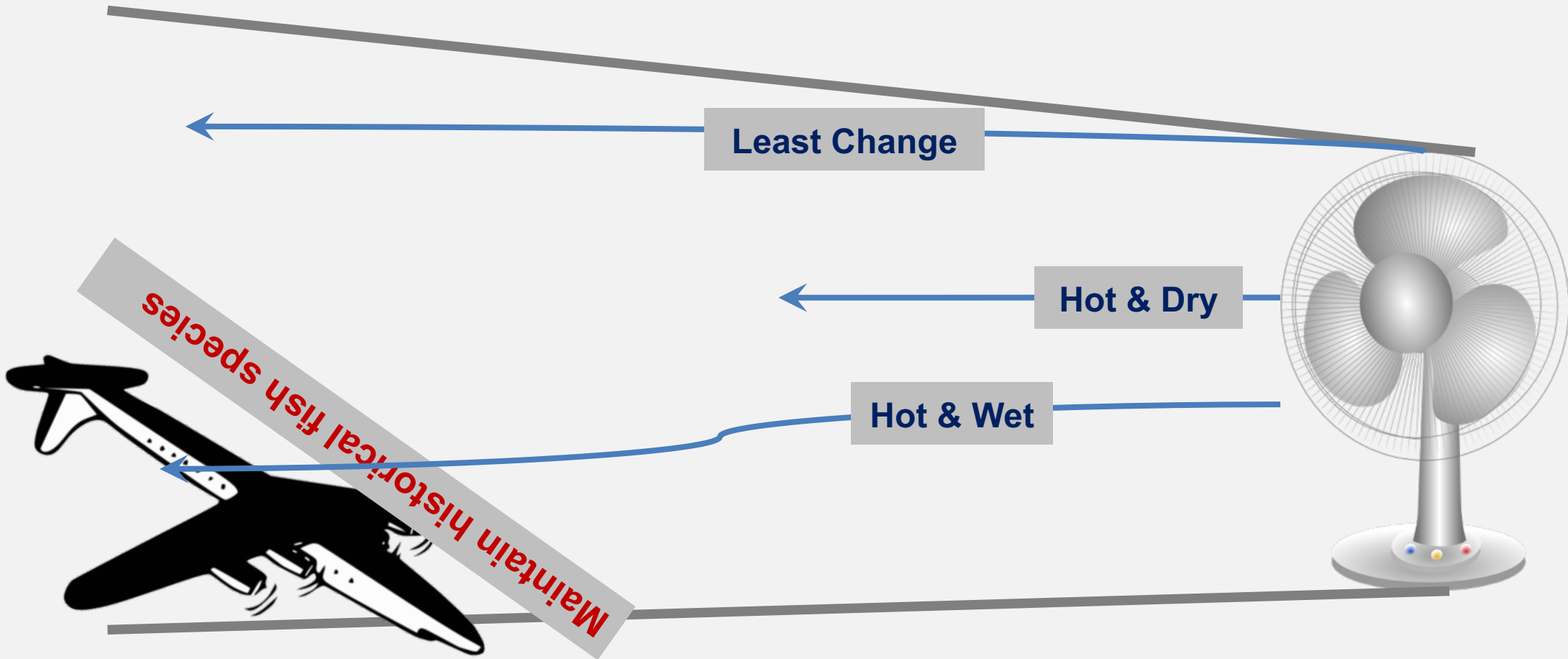
Applying Scenarios



Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Applying Scenarios

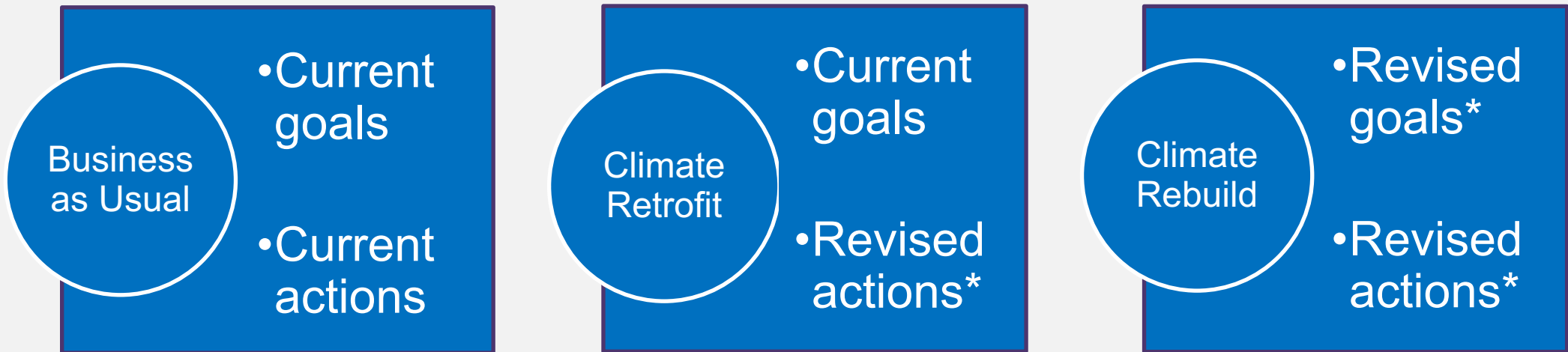


Graphic: Modified from NPS Climate Change Response Program

Overview of Scenario Planning

Applying Scenarios

- Management responses
 - Aligning goals and actions

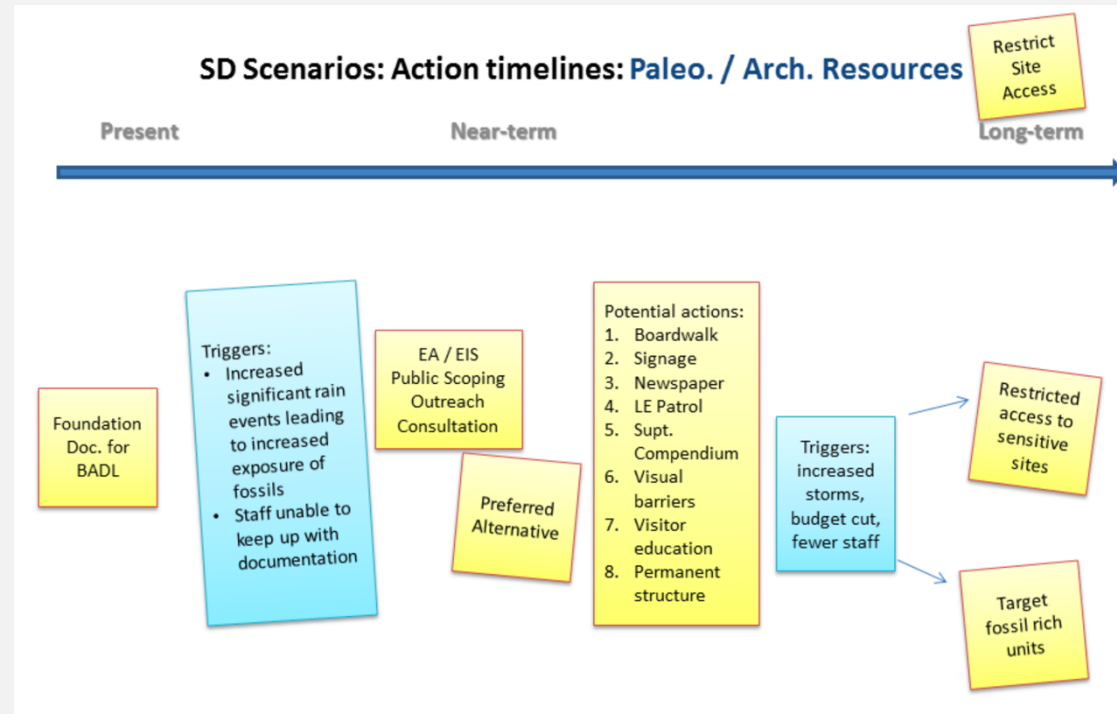


Adapted from: Stein, B.A., Glick, P., Edelson, N. and Staudt, A., 2014. Climate-smart conservation: putting adaption principles into practice. National Wildlife Federation.

Overview of Scenario Planning

Applying Scenarios

- Management responses
 - Action timelines



Fischelli, N.A., Schuurman, G.W., Symstad, A., Ray, A., Miller, B., Cross, M., Rowland, E., 2016. Resource management and operations in southwest South Dakota: Climate change scenario planning workshop summary January 20-21, 2016, Rapid City, SD. Natural Resource Report. Report No. NPS/NRSS/NRR—2016/1289

Overview of Scenario Planning

Applying Scenarios

Examples

SECTION 3 EXAMPLES OF SCENARIO PLANNING IN NATURAL RESOURCE MANAGEMENT AND CONSERVATION	69
3.1 LAND USE AND CLIMATE CHANGE SCENARIOS FOR THE PENINSULAR FLORIDA LANDSCAPE CONSERVATION COOPERATIVE	74
3.2 SCENARIO PLANNING AS A TOOL FOR CLIMATE CHANGE ADAPTATION PLANNING: NATIONAL PARK SERVICE, ALASKA REGION	82
3.3 CLIMATE CHANGE CONSIDERATIONS IN NATIONAL PARK SERVICE PLANNING: PINNACLES NATIONAL MONUMENT, CALIFORNIA	89
3.4 ALTERNATIVE FIRE MANAGEMENT FUTURES IN THE SOUTHERN SIERRA NEVADA ECOREGION, CALIFORNIA.	94
3.5 CLIMATE CHANGE SCENARIO PLANNING IN THE CROWN OF THE CONTINENT ECOSYSTEM (MONTANA, ALBERTA, BRITISH COLUMBIA)	101
3.6 SAN FRANCISCO ESTUARY, CA: TIDAL MARSH RESTORATION AND CONSERVATION PLANNING IN THE FACE OF UNCERTAINTY	109
3.7 INTEGRATED SCENARIOS AND OUTREACH FOR HABITAT THREAT ASSESSMENTS ON CENTRAL VALLEY AND INNER COAST RANGE RANGELANDS, CA	113
3.8 ADAPTING TO AN UNCERTAIN FUTURE: DECISION SUPPORT FOR LONG TERM PROVISION OF ECOSYSTEM SERVICES IN THE SNOHOMISH BASIN, WA.	120
3.9 VULNERABILITY ASSESSMENTS FOR WETLANDS OF THE MASSACHUSETTS BAYS PROGRAM AND SAN FRANCISCO ESTUARY PARTNERSHIP.	126
3.10 SCENARIOS OF LAND USE, CLIMATE CHANGE AND TRANSFORMATIONS OF FOREST LANDSCAPES IN MASSACHUSETTS	129
3.11 FLORIDA KEYS MARINE ADAPTATION PLANNING (KEYSMAP) – A MARINE-BASED SCENARIO-PLANNING PROJECT	133
3.12 CLIMATE ADAPTATION PLANNING FOR THE BEAR RIVER BASIN, UTAH.	137

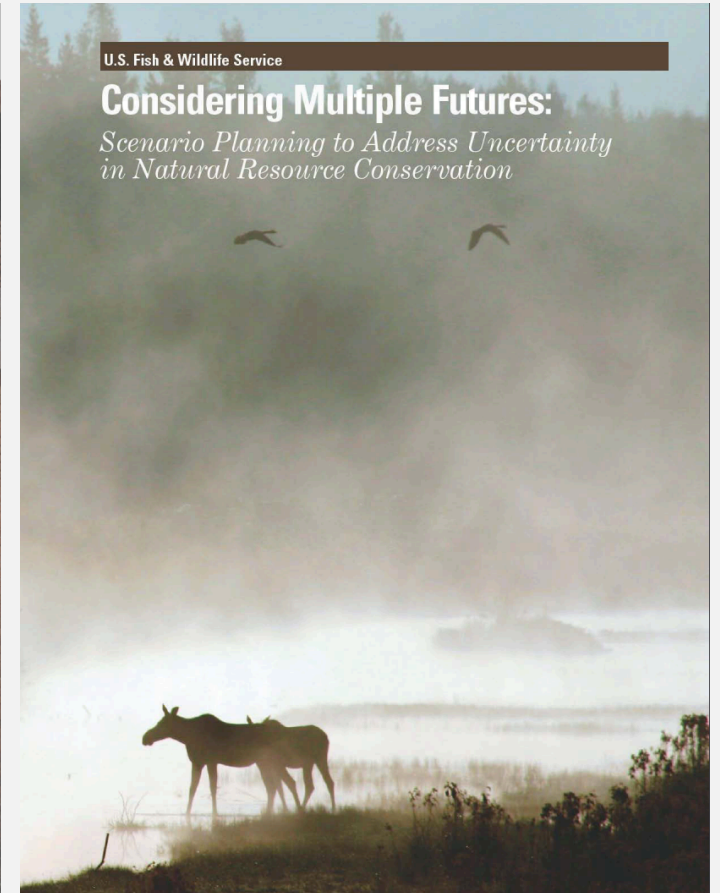
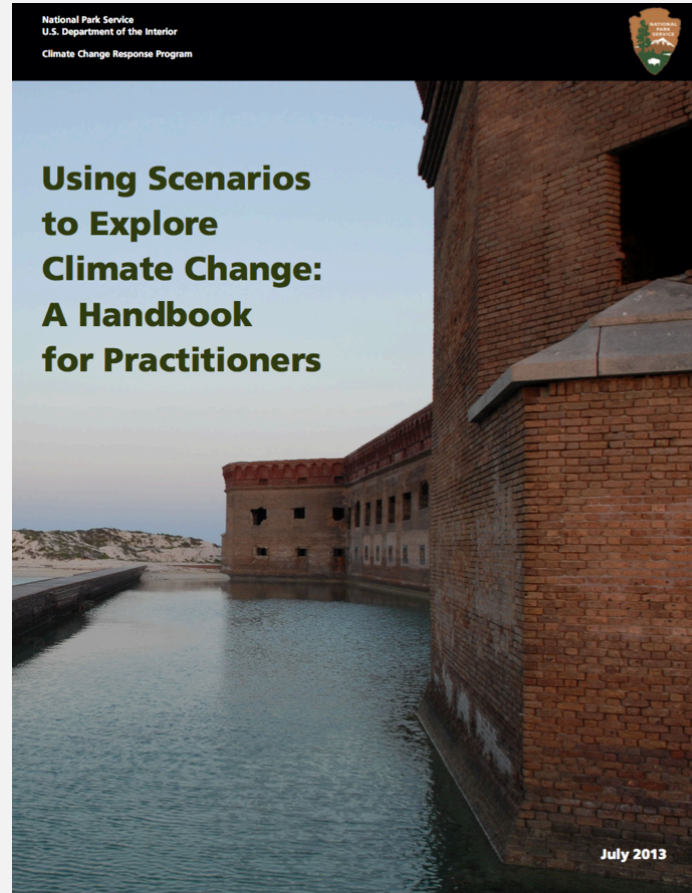


Rowland, E.R., Cross, M.S., Hartmann, H. (2014) Considering Multiple Futures: Scenario Planning to Address Uncertainty in Natural Resource Conservation. Washington, DC: US Fish and Wildlife Service.

Overview of Scenario Planning

Summary

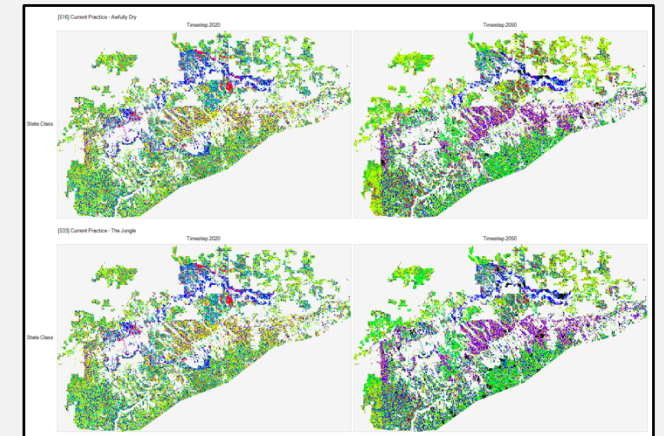
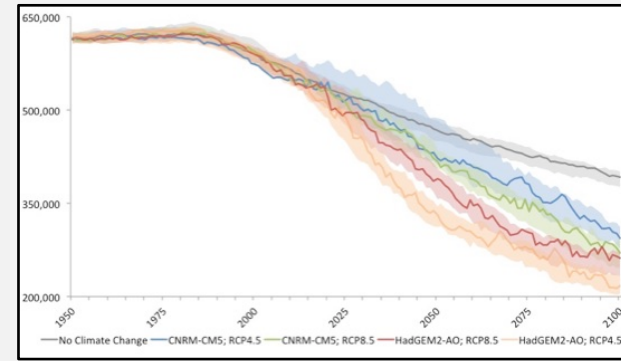
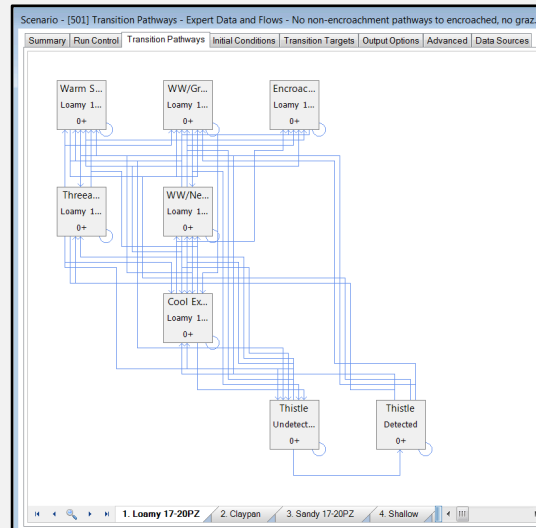
- We can't predict the future
- But we can create informed plans that account for uncertainty
- Qualitative scenario planning has proven useful in a variety of contexts



Overview of Scenario Planning

Quantitative scenario planning

- Now combining with quantitative methods to improve specificity and uncover surprises...



Images: B.W. Miller



Gombe
National Park

Questions?

Thank you!
