Module 7 – Applying Scenarios
Phase III – Applying Scenarios

The context of this Module

- Assess Impacts
- Consider Implications for Management
- Develop Responses

An Overview of the Module

Phase 3. Steps
1. Evaluate the potential impacts and implications of the scenarios
2. Identify potential strategies or action options
3. Prioritize options and selecting near-term strategies and actions
4. Structuring monitoring and research around planning and decision-making

Phase 3. Outcomes
- Summary of scenario impacts on resources and implications for management
- List of research needs, knowledge gaps
- Tactical plan, including:
  - Actions to take now
  - Timeline for future decisions and contingencies
  - Indicators and monitoring plan
By the end of the session, you should be able to:

- Understand how different scenarios may impact different resources
- Integrate scenarios into decision-making processes
- Understand how scenarios influence the viability of alternative management strategies
- Apply scenarios to understand implications of specific decisions
- Develop specific strategies and actions related to management objectives
- Develop monitoring programs to evaluate scenarios structured around decision-making
- Evaluate and prioritize specific short-term actions related to outcomes of monitoring plan
- Understand the concept of triggers (hard triggers and soft triggers)
Step 1 – Evaluate the Potential Impacts and Implications of the Scenarios

- Can be based on
  - Models
  - Expert Opinions
  - Workshops
  - Observations
  - Paleoecology

- Model-Based
  - SLAMM (Sea Level Affecting Marshes Model)
  - SLOSH (Sea, Lake, and Overland Surges from Hurricanes)
  - Downscaled models (statistical or dynamic)
    - Examples include rainfall, snowpack, sea surface temperature, winds, impacts on hurricanes
IPCC AR4 SLR Scenarios

How the models can be used

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Extending the SRES to SLR

Initializing models
Visualizing Sea Level Rise

SLAMM Converts To Table

Table 3: Assumed Effects of Invasion and Erosion.

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<th>Converting From</th>
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<td>Erosion of dry land is ignored</td>
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<td>Inland Fresh Marsh</td>
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<tr>
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<td>to Regularly Flooded Marsh</td>
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<tr>
<td>Regularly Flooded Marsh</td>
<td>to Total Flat</td>
<td>Erosion to Total Flat</td>
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<td>Marshes</td>
<td>to Estuarine Water</td>
<td>Erosion &amp; Invasion to Estuarine Water</td>
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<tr>
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<td>to Open Ocean</td>
<td>Erosion to Open Ocean</td>
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<tr>
<td>Total Flat</td>
<td>Raritan, Invasion to Estuarine Water</td>
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<tr>
<td>Estuarine Beach</td>
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<td>Erosion to open water</td>
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Example 1 – SLR Impacts on Loggerhead Turtle Nesting

Modeling Socio-economic conditions
Expert Opinion

Understanding the Effects
How the model works

Visualizing Effects
Example 1 – Identifying Exogenous Stressors in Marine Systems

What other information can experts provide?
Example 2 – Spiny Lobster Thresholds

- Temperature > 31 C
- Salinity
  - These combine to limit distribution

Lobster settlement under Sea Level Rise
What to Monitor

1. Water temperature
2. Salinity
3. Larval Collectors
4. Juvenile

Range Expansion under Different SLR Scenarios – The American Crocodile
Observational Information

Workshops
Workshop outputs
How Climate Change Interacts with Mangrove habitats – MARES

American Crocodile & Intervention Points
Example 2 - Effects of Scenarios on Future Distribution of Florida Panther

Current Distribution of Florida Panther

Dispersal Area
Background on the Scenario Dimensions

Mixing Models and Expert Opinion

Scenario B

Scenario C
Scenarios vs. panthers

What can the past teach us about the future
- Species distributions
- Species/habitat associations

Paleo-ecology

Figure 1. Location of regions with 5% beach (Paspalum) pollen and 5% hemlock (Tsuga) pollen (in the upper row maps) and 20% southern pine (Pinus) pollen and 20% oak (Quercus) pollen (in the lower row of maps) at 12,000, 8,000, 6,000, and 500 yr B.P. with the stippled area in the north showing the shrinking Laurentide ice sheet from 12,000 to 6,000 yr B.P. Source: Modified from Plates 1 and 2 in Jacobson, With, & Grimm 1987.

How do we study as ecologists if we do not ask us questions about the human past or future, is essentially conditioned by our current observations and personal experience. The further our explanations carry us from the present, the harder our research becomes. This is not just because...
Step 2 – Develop Responses

Conceptualizing Actions

Scenario 1
- Monitoring

Scenario 2
- Monitoring

TRIGGERPOINT

ADAPTATION

STRATEGY
**Triggerpoints**

- Triggers (hard), when tripped, will activate near and long-term actions (e.g., shift in species composition, tipping point on SST)
  - hydro operations, predator control, harvest, safety-net hatchery programs, and long-term contingency actions that may be taken.
- ‘Soft triggers’ (Non-discrete changes along a continuum)
  - “Early warning indicator” will alert agencies for example to a decline in species’ abundance level that warrants further scrutiny because it indicates that a significant decline may be reached in one to two years. (Indicators that indicated decline)

**Examples of triggers?**
Action Development

- Can be based on
  - Expert Opinions
  - Workshops
  - Similar examples

Workshops – Coping with Increased SST
What the models can tell us about SST

Water Temperatures under Different RCPs based on models

Workshop-based Adaptation Strategies for Increases to SST

**Approach**

1. Protect area(s) where Temperature is cooler
2. Enhance natural habitat where temperature is cooler
3. Translocating heat tolerant individuals and species
4. Protect seed areas (population sources)
5. Geoengineering
   a. Sand dynamics
   b. Habitat creation for shoreline protection
   c. Shade, upwelling to protect specific locations when threshold is reached
6. CERP
7. Large reserves with diverse habitats and connectivity
8. Enhance water quality
9. Endangered Species Act
No–Regrets Strategies – what can we do now to prepare?

- Permitting
- Engineering designs
- Modeling
- ?

The Soft Triggers and No–Regrets Strategies
Some questions to consider:

- Should we be thinking about this issue or resource of concern differently?
- Do our current actions or strategies associated with this resource still make sense in light of the ways that the future might unfold? If not, how should we modify them?
- Are there opportunities created by the scenario(s)?

Broadening the Relevancy

- Fighting with the Neighbors
- Room to Move
- Surrounded on all Sides
Step 3 – Prioritizing Options

- How can I prioritize options?
- What options are the low-hanging fruit?
- What options are more difficult
- What are no-regrets strategies that should be employed immediately to prepare you for the actions actuated by the triggers?

Prioritizing Options for SST

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<th>Issue</th>
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<th>Feasibility</th>
<th>Effort Required</th>
<th>Priority</th>
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<td>2 Enhance natural habitat where temperature is cooler</td>
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<td>3 Translocating heat tolerant individuals and species</td>
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<td>+</td>
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<td>4 Protect seed areas (population sources)</td>
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<td>low</td>
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<td>5 Geoengineering</td>
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<td>b Habitat creation for shoreline protection</td>
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<td>c Shade, upwelling to protect specific locations when threshold is reached</td>
<td>$$$</td>
<td>+</td>
<td>Low</td>
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<td>6 CERP</td>
<td>$$$</td>
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<td>high</td>
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<td>7 Large reserves with diverse habitats and connectivity</td>
<td>$</td>
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<td>8 Enhance water quality</td>
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<tr>
<td>9 Endangered Species Act</td>
<td>$</td>
<td>+</td>
<td>low</td>
<td>1</td>
<td>already occurring</td>
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</table>
Revisiting the approach

- Are the right people at the table?
- Do we have the best information available?
- Are the goals still relevant?

Are current actions or strategies still relevant in light of the ways that the future might unfold?

- As scenarios develop or the science evolves, what new actions may be available or required?
- Can new technologies change actions?
- Are political changes captured in existing actions?
- This links to Module 12
Some questions to consider:
- Should we be thinking about this issue or resource of concern differently?
- Do our current actions or strategies associated with this resource still make sense in light of the ways that the future might unfold? If not, how should we modify them?
- Are there opportunities created by the scenario(s)?
You are a manager of Dry Tortugas National Park tasked with managing cultural resources. Changes in hurricane frequency are unknown but frequency of major hurricanes (Category 3) are predicted to increase proportional to increased SLR. Currently the fort is slowly crumbling but being maintained by full-time crew of masons.

Group 1: low SLR – storm surge Cat 3+ hurricane severely crumbles Fort Walls, fort floods
Group 2: medium SLR – walls seriously damaged with Cat 1–2 hurricane, sand around fort moves extensively, fort floods on high tides (6x/year)
Group 3: high SLR – Fort flooded, walls crumble extensively on ongoing basis, winter storms --> large chunk of wall fall

**Excercise 1**

Create 2–3 adaptation strategies based on your scenario.
Break-Out Exercise 1

- You are a manager of Dry Tortugas National Park tasked with managing cultural resources.
- Changes in hurricane frequency are unknown but frequency of major hurricanes (Category 3) are predicted to increase proportional to increased SLR.
- Fort maintained by masons.

Group 1: low SLR – storm surge Cat 3+ hurricane severely crumbles Fort Walls, fort floods.
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Group 3: high SLR – Fort flooded, walls crumble extensively on ongoing basis, winter storms → large chunk of wall fall.

Exercise 2

Determine triggerpoint(s) that will actuate strategies. Are there any soft triggers that can be employed?

Break-Out Exercise 1

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Exercise 3

Develop monitoring program to determine when triggerpoints (hard and soft) are reached.
Break–Out Exercise 1

- You are a manager of Dry Tortugas National Park tasked with managing cultural resources.
- Changes in hurricane frequency are unknown but frequency of major hurricanes (Category 3) are predicted to increase proportional to increased SLR
- Fort maintained by masons

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Exercise 4

What no–regret strategies can be enacted now?

Break–Out Exercises

- You are charged with identifying strategies to conserve the Key Deer.

Questions
1. How could you assess the potential impacts?
2. What strategies could you employ to address impacts?
3. What are some potential triggerpoints to actuate actions?
4. What monitoring programs could you put into place to monitor for triggers?
5. How would you prioritize the strategies?