



Cape Cod National Seashore Town of Wellfleet



**Herring River Stakeholders Group
June 19, 2019**

Adaptive Management and Decision-Analysis Update

Tim Smith
Restoration Ecologist
Cape Cod National
Seashore
tim_p_smith@nps.gov





Cape Cod National Seashore Town of Wellfleet



Herring River Stakeholders Group
June 19, 2019

Adaptive Management and Decision-Analysis Update

- Previous Presentation at Last Meeting*

HERRING RIVER: Structured Decision-Making & Adaptive Management

WHAT IS STRUCTURED DECISION MAKING AND ADAPTIVE MANAGEMENT?

STRUCTURED DECISION MAKING

“PrOACT”

“Pr” = Problem Statement

“O” = Objectives

“A” = Actions/Alternatives

“C” = Consequences

“T” = Trade-Offs

HERRING RIVER: Structured Decision-Making & Adaptive Management

BASIC APPLICATION OF SDM AND AM FOR HERRING RIVER

“PrOACT”

“O” = Objectives





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Adaptive Management and Decision-Analysis Update

- *Summary of AM program*

2013: Initiate Collaboration with USGS Decision Science Program

- Ad hoc stakeholder meetings
 - ✓ October 2014
 - ✓ November 2015

The screenshot shows the USGS Decision Analysis webpage. The header includes the USGS logo and navigation links for SCIENCE, PRODUCTS, NEWS, CONNECT, and ABOUT. Below the header is a search bar and a navigation menu with 'Overview', 'Publications', and 'Data and Tools'. The main content area features a large image of a wetland landscape. Below the image, there is a paragraph of text describing the program's goal: 'USGS scientists work with decision makers and stakeholders to develop decision analytic frameworks to deliberately reduce the uncertainty that negatively affects the quality of decisions whether made once (i.e., Structured Decision Making) or repeatedly (i.e., Adaptive Management)'. To the right of this text, it says 'Status - Active'. Below the text, there is a 'CURRENT USGS SCIENCE:' section with a link to 'Forest and Rangeland Ecosystem Science Center (FRESC)' and a sub-link to 'Frameworks, Strategies and Protocols for Monitoring and Interdisciplinary Research'. At the bottom right, there is a 'Contacts' section for Lianne Ball, Ph.D., with her title 'Environments Program Manager, Ecosystems' and email 'lball@usgs.gov'. A small diagram with three nodes is also visible at the bottom center.

In order to assess whether stakeholder concerns have been adequately captured within the existing list of objectives, USGS led the group in an exercise to answer the following questions:

- What do you want to achieve [with the Herring River Restoration project]?
- What do you want to avoid [with the Herring River Restoration project]?



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Adaptive Management and Decision-Analysis Update

• Summary of AM program

2013: Initiate Collaboration with USGS Decision Science Program

• Ad hoc stakeholder meetings

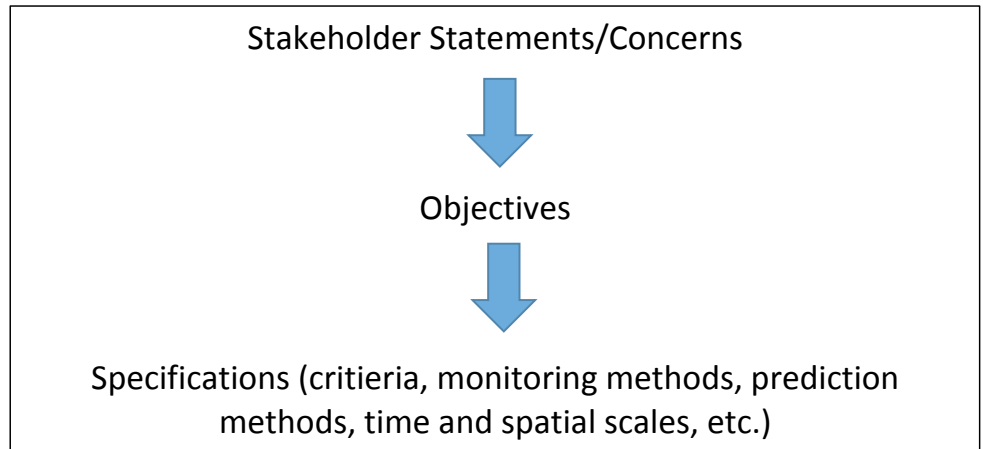
✓ October 2014

✓ November 2015

• What do you want to achieve [with the Herring River Restoration project]?

• What do you want to avoid [with the Herring River Restoration project]?

The screenshot shows the USGS Decision Analysis webpage. At the top is the USGS logo with the tagline 'science for a changing world'. Below the logo are navigation tabs for SCIENCE, PRODUCTS, NEWS, CONNECT, and ABOUT. A search bar is located to the right of these tabs. The main content area features a large photograph of a marshy landscape. Below the photo are tabs for Overview, Publications, and Data and Tools. A paragraph of text describes the program's goal: 'USGS scientists work with decision makers and stakeholders to develop decision analytic frameworks to deliberately reduce the uncertainty that negatively affects the quality of decisions whether made once (i.e., Structured Decision Making) or repeatedly (i.e., Adaptive Management)'. To the right of this text is a 'Status - Active' indicator. Below the text are sections for 'CURRENT USGS SCIENCE' with links to the Forest and Rangeland Ecosystem Science Center (FRES-C) and the Fort Collins Science Center (FORT). A flowchart diagram is visible in the bottom right corner of the screenshot, showing a process flow from 'Problem' through 'Objectives' and 'Alternatives' to 'Management' and 'Monitoring'. Other sections include 'Contacts' with information for Lianne Ball, Ph.D., and 'Explore More Science' with links to various decision support systems.





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Adaptive Management and Decision-Analysis Update

HERRING RIVER: Structured Decision-Making & Adaptive Management

BASIC APPLICATION OF SDM AND AM FOR HERRING RIVER “PrOACT”

“O” = Objectives; Socioeconomic/“BioSocial” Objectives: Developed With Input From AdHoc Stakeholders Meetings and Other Consultations, 2013-15

- Prevent Impacts to Structures and Roads
- Minimize Risk to Public Safety
- Minimize Risk at Water Control Structures
- Maximize Access to Emergency Response
- Minimize Adverse Impacts to Shellfish Beds
- Minimize Excess Nitrogen Export
- Minimize Fecal Coliform Levels
- Minimize Deposition onto Shellfish Beds
- Minimize Loss of Privacy
- Maximize Aesthetics
- Minimize Negative Appearance
- Minimize Hydrogen Sulfide Smell
- Minimize Noise
- Minimize Turbidity
- Minimize Community Conflict
- Maximize Natural Mosquito Control
- Maximize Greenhouse Gas Sequestration
- Maximize Shellfishing Opportunities
- Maximize Recreational Opportunities
- Minimize Loss of Recreational Opportunities
- Maximize New Recreational Opportunities



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Adaptive Management and Decision-Analysis Update

TO EVALUATE DECISIONS:

- Some Form of Prediction Is Needed for Each Objective So That We Can Evaluate & Compare The Effectiveness of the Management Options That Are Under Consideration

PREDICTIONS CAN COME FROM:

- Numerical Models (i.e. computer simulations of hydrology, vegetation change)
- Judgments/Elicitation From Experts and Stakeholders

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BASIC APPLICATION OF SDM AND AM FOR HERRING RIVER

“PrOACT”

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- | | |
|----------------------------------------------|-----------------------------------------------|
| • Prevent Impacts to Structures and Roads | • Minimize Negative Appearance |
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| | • Maximize New Recreational Opportunities |



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Some Ecological Objectives Have Direct Predictions from the Hydrodynamic Model and Sea Level Affecting Marshes Model:

- Tide Range
- Hydroperiod
- Salinity
- Residence Time (water quality)
- Vegetation Change

Other Ecological Objectives Do Not Have Numerical Models and We Are Relying on Judgments from Recognized Subject-matter Experts:

- Water Quality
- Sediment Transport and Accretion
- Benthic and Shellfish Habitat
- Mosquito Habitat
- Hydrogen Sulfide Production

Socioeconomic Objectives Also Need to Be Quantified and Predicted in a Manner Similar to Ecological Objectives:

Minimize loss of privacy for abutting property owners	Maximize recreational opportunities
Maximize aesthetics	<i>Minimize loss of existing recreational opportunities</i>
<i>Maximize viewscapes from public vantage points</i>	<i>Maximize newly created recreational opportunities</i>
<i>Minimize negative appearance of dead woody veg</i>	
<i>Minimize hydrogen sulfide smell</i>	Prevent impacts to structures and roads
	Minimize risk to public safety
	<i>Minimize risk to public at water control structures</i>
	<i>Minimize risk to public elsewhere</i>
Minimize community conflict	<i>Maximize access to emergency response</i>



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For A Fully Informed Analysis of
Management Decisions for the Herring
River:

- Develop Measureable, Quantified Attributes for All Objectives
- Identify Methods to Monitor
- Establish Pre-restoration, Baseline Conditions
- Formulate Predictions of Future Conditions Over a Range of Possible Management Strategies (i.e. varying approaches to managing new tide gates)

For Ecological Objectives:

- Numerical Model Output
- A Web-based Survey for Recognized Subject-matter Experts; informed by numerical models

For Socioeconomic Objectives:

- Developing Methods to Elicit Information in a Systematic and Quantifiable Manner From Stakeholders and the Broader Community
- Will Present More Specific Plans at the Next Meeting



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Excerpted Comments from 2014 AdHoc Stakeholder Meeting

- “...wanted to see that anadromous and catadromous fish have adequate passage to migrate; avoid conflict in the community...”
- “...wanted to make sure that the public understands the environmental benefits of the Restoration Project; noted that there would be both ecological and aesthetic benefits of restoring tidal flow; avoid conflict in the community.”
- “...wanted to achieve a consensus and a good working relationship among all the stakeholders.”
- “...wanted to achieve restoration of all the ecological services that the river system used to provide; concerned about “drowning” the salt marsh in areas where the marsh surface has subsided; noted that sediment accretion is needed to restore healthy salt marsh vegetation.”
- “...herring and eels should be considered stakeholders, as they will benefit greatly from restoring a healthy salt marsh; avoid impacts to these species during the construction process.”
- “...concerned that vegetation die-off in the river could negatively impact shellfish beds in the harbor; concerned that traditional recreational opportunities such as dog walking, horseback riding, hunting, and berry picking could be lost.”
- “...would like to see improved water quality in the river so that residents and visitors could enjoy the things that a restored natural system can offer; concern that community acrimony could prevent the Restoration Project from being completed.”
- “...wants to see a playable golf course at CYCC; hopes that the Restoration Project will have a system in place to address low-lying property impacts...”