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Using Structured Decision Making-Stakeholder Engagement to Integrate Community Values With Scientific Understanding For Better Decision Making

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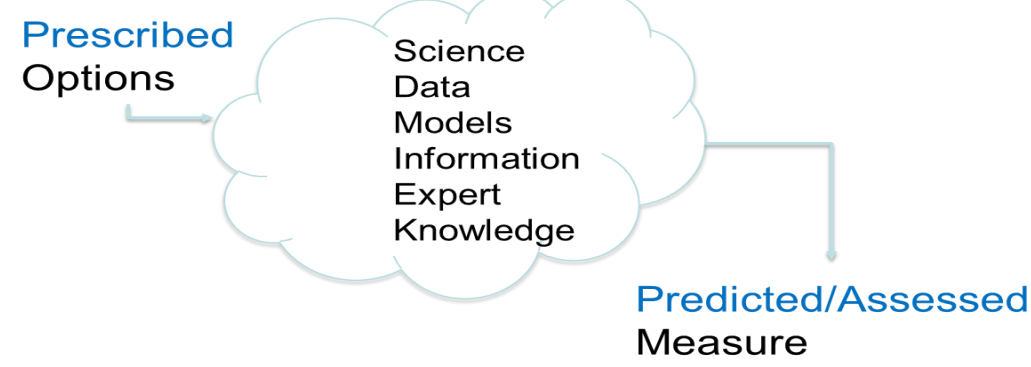
Overview

Many of Societies management and growth decisions are often made without a more explicit consideration of pertinent factors from environmental, economic and societal perspectives. The USEPA developed DASEES (Decision Analysis for a Sustainable Environment, Economy and Society) to help decision makers better characterize and analyze these problems. DASEES supports the integration of stakeholder values with scientific information through eliciting values, constructing formal objectives, assigning performance measures to those objectives, and developing options designed to be responsive to objectives and thus stakeholder values. Once options are developed, scientific knowledge is used to assess consequences of the implementation of these options. These assessments are evaluated against multiple objectives with measures including human health, economic effects and ecosystem services. DASEES uses a five-step structured decision process where the foundation is a stakeholder values-focused process that leads to decisions and actions that have broad stakeholder support which translates to more informed decisions consistent with stakeholder values and better overall decisions for communities.

Values-Science Integration in DASEES

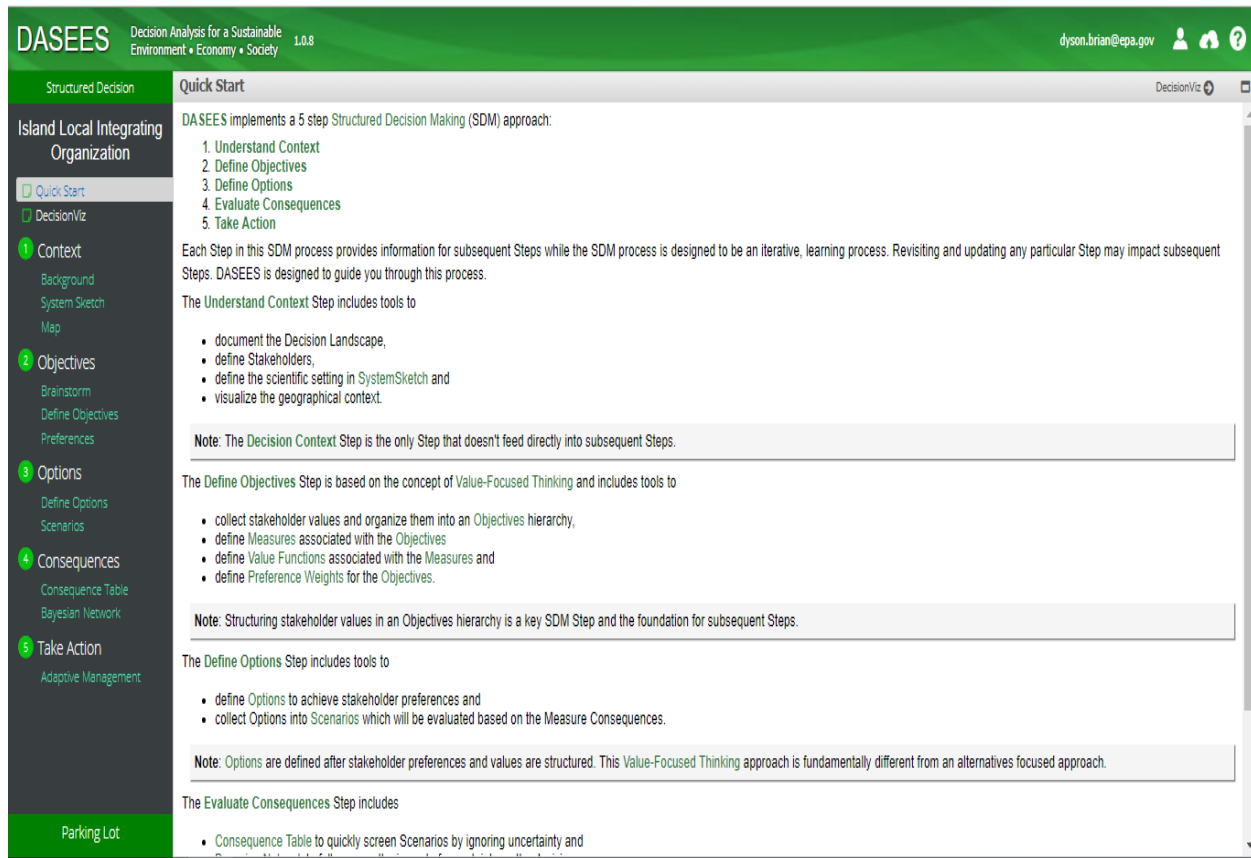
Values → Objectives → Measures → Options

- Options are developed in response to and evaluated against value-based objectives and their measures
- Science is used to assess consequences of options



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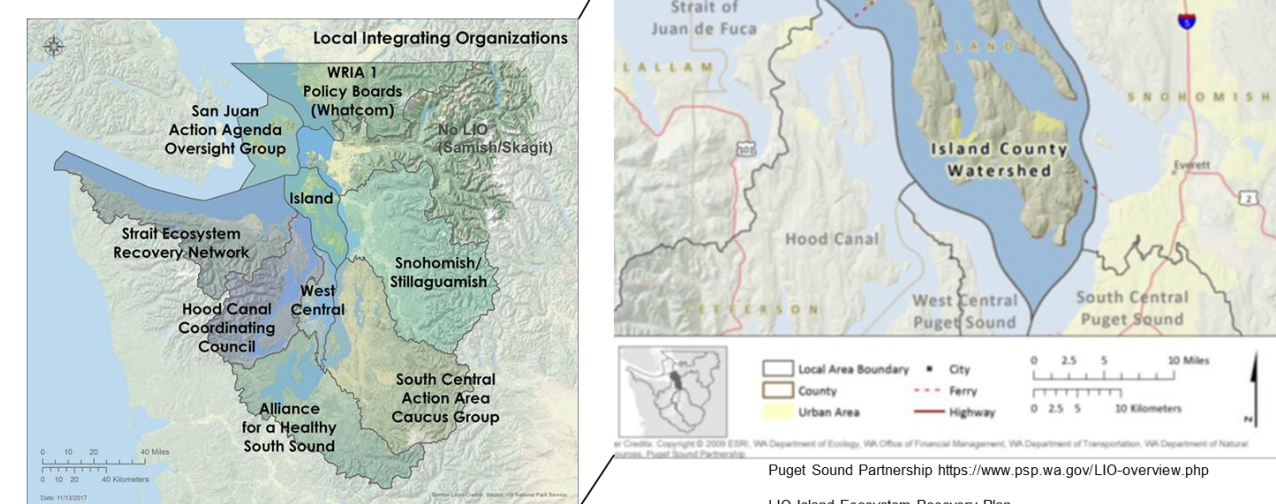
DASEES Home Screen



The Home Screen gives the user an overview of the information needed for each of the five steps

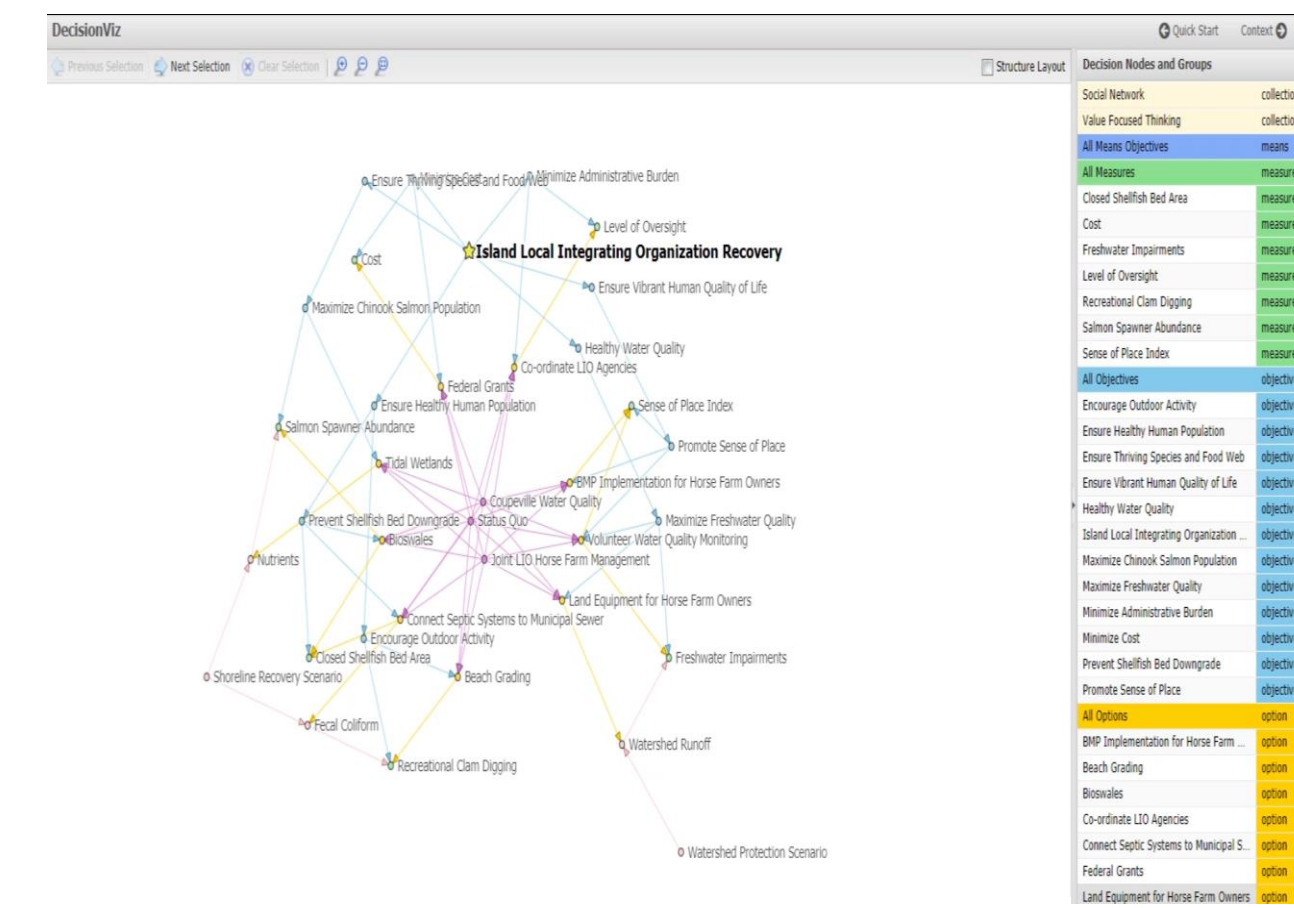
Step 1: Understand Context

- Whidbey Island (Penn Cove)
- City of Coupeville
- Camano Island (Port Susan)
- Joint Effort with Snohomish/Stillaquamesh LIO



Decision Context: What is driving the need for decisions

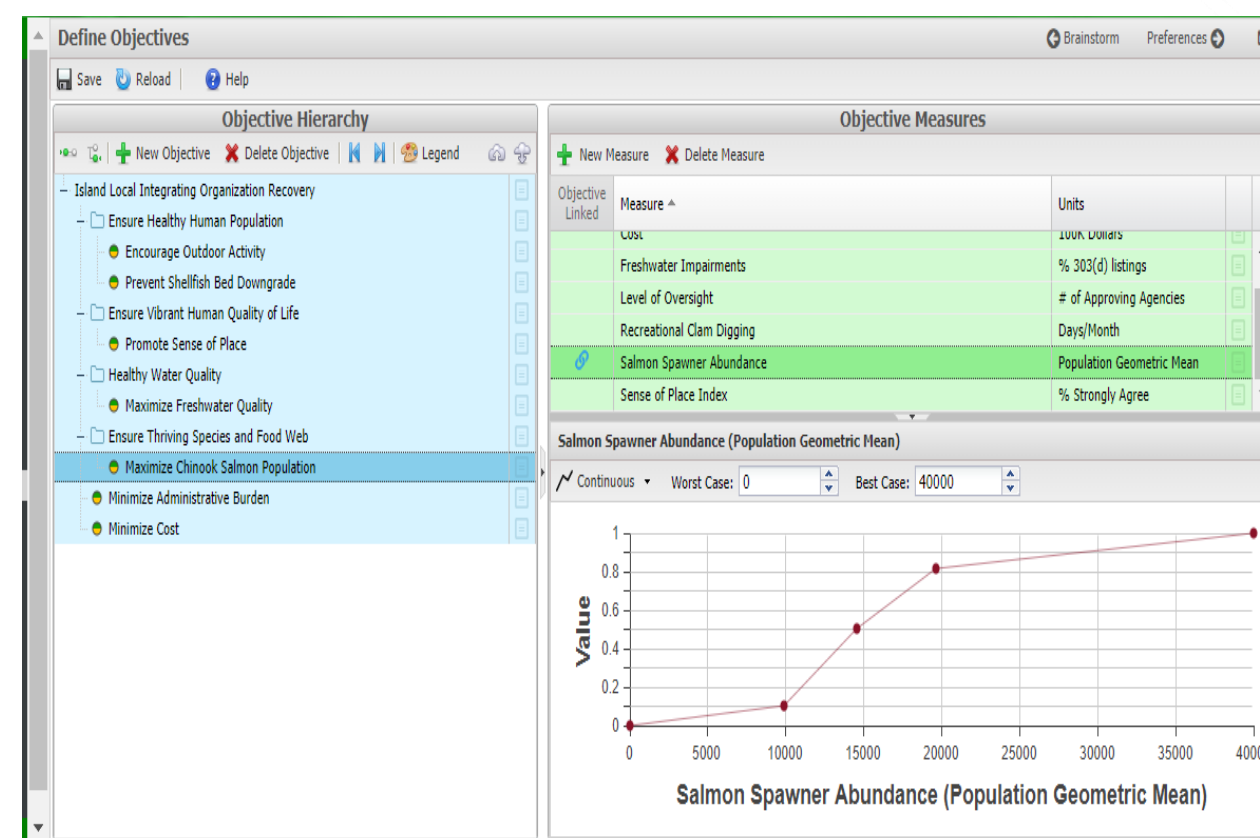
DecisionViz Conceptual Modeling of Decision Problem



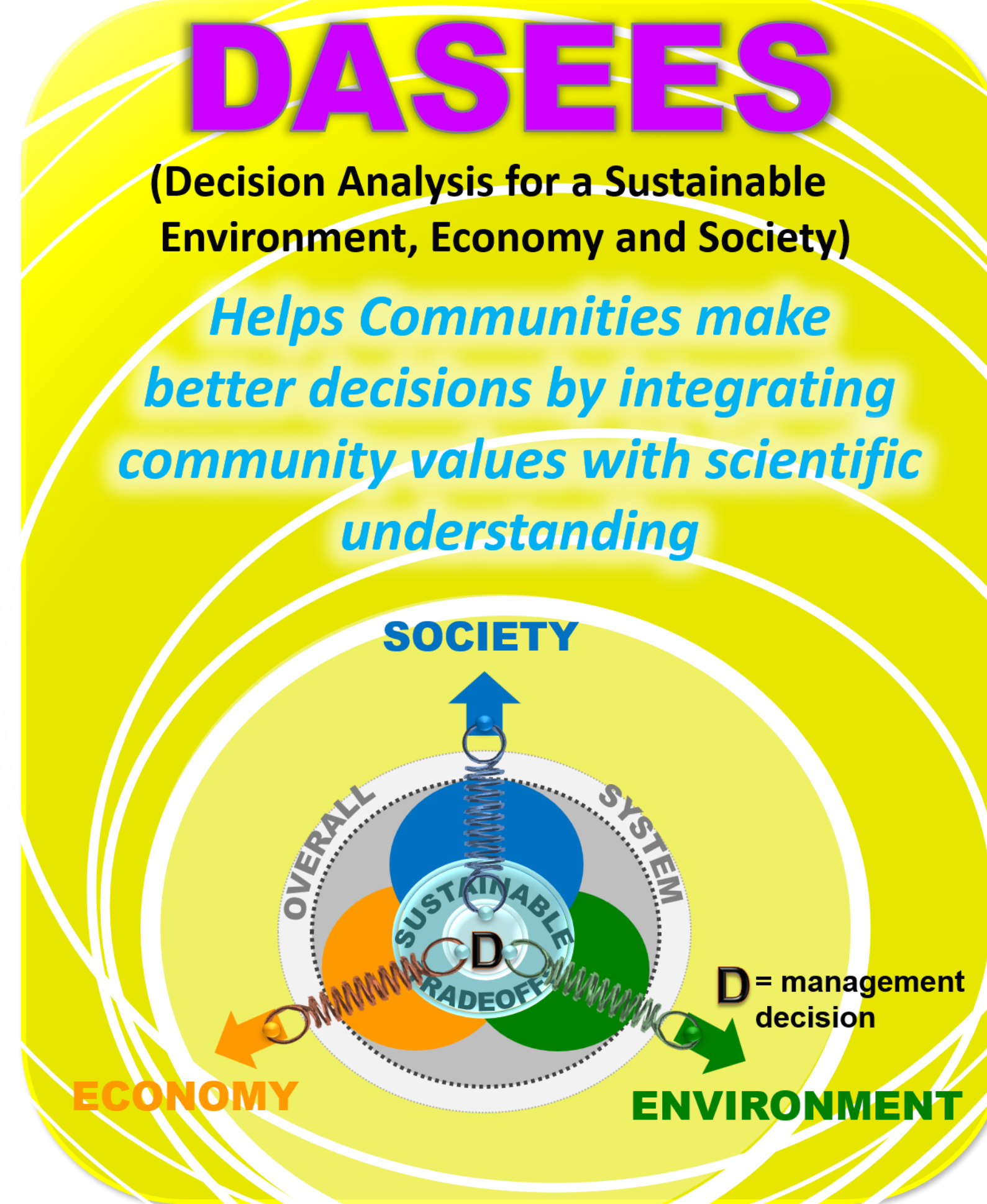
DecisionViz generates a graphical conceptual model of your decision. The colored lines in the model correspond with the items in the right side panel. The model connects objectives, measures, options, etc to show how decision-relevant information is linked and used.

Step 2: Define Objectives and Measures

Structuring Objectives and Integrating Measures Science Normalizing Results

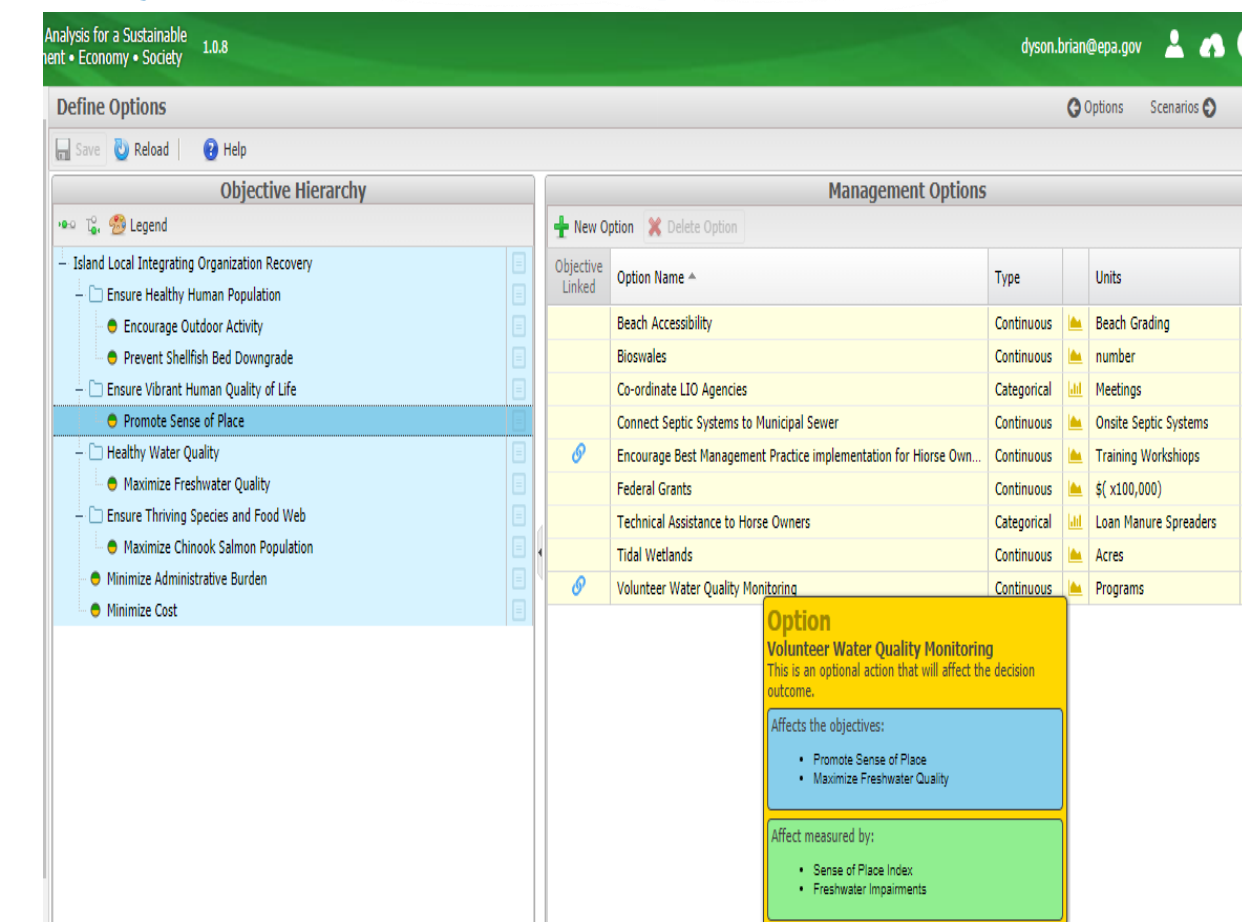


Define objectives to address problem. Each objective requires a measure to track progress of objective attainment through option implementation. The value function is adaptable and rate of change in value can be adjusted to reflect changes required by biophysical or regulatory necessity, or decision-maker risk tolerance.



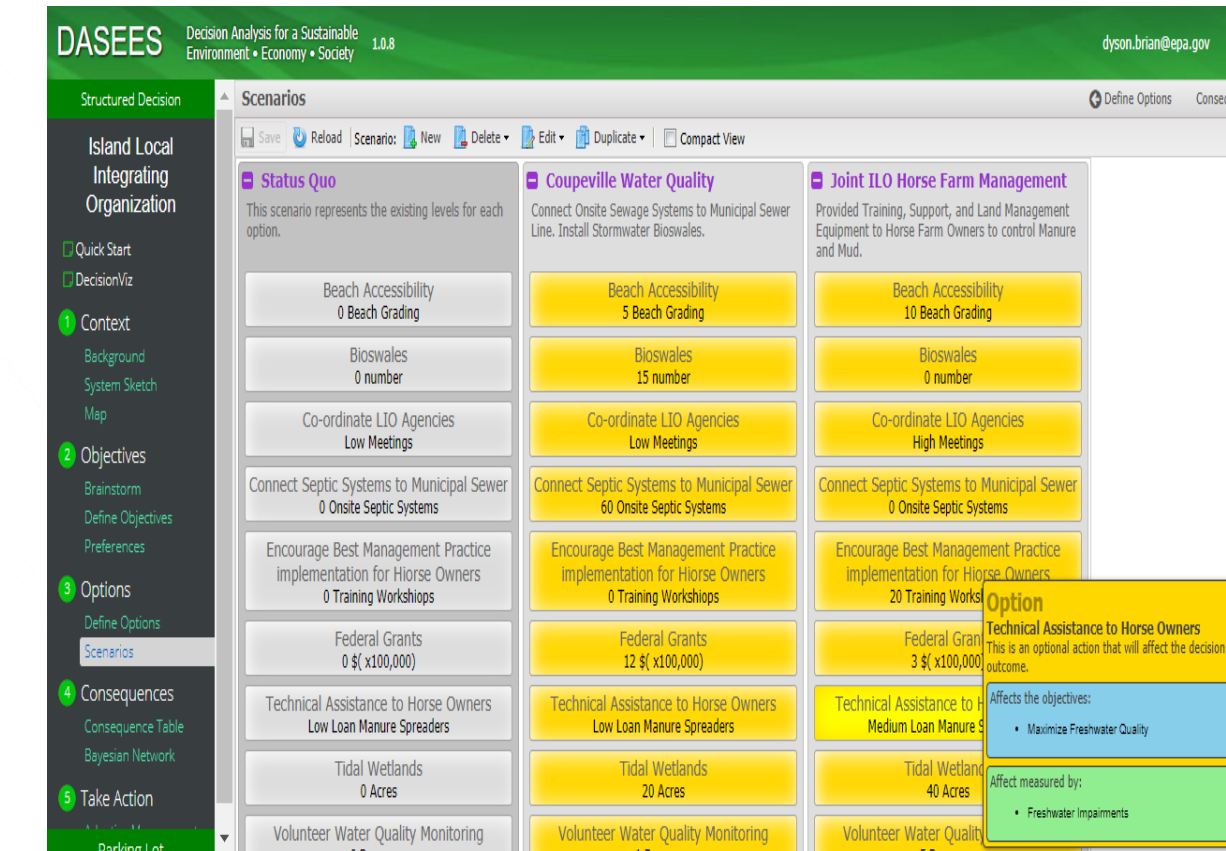
Step 3: Define Options

Objectives, Measures, Options



After objectives and measures are assigned, normalized and weighted, options (actions) that affect measures and objectives are developed.

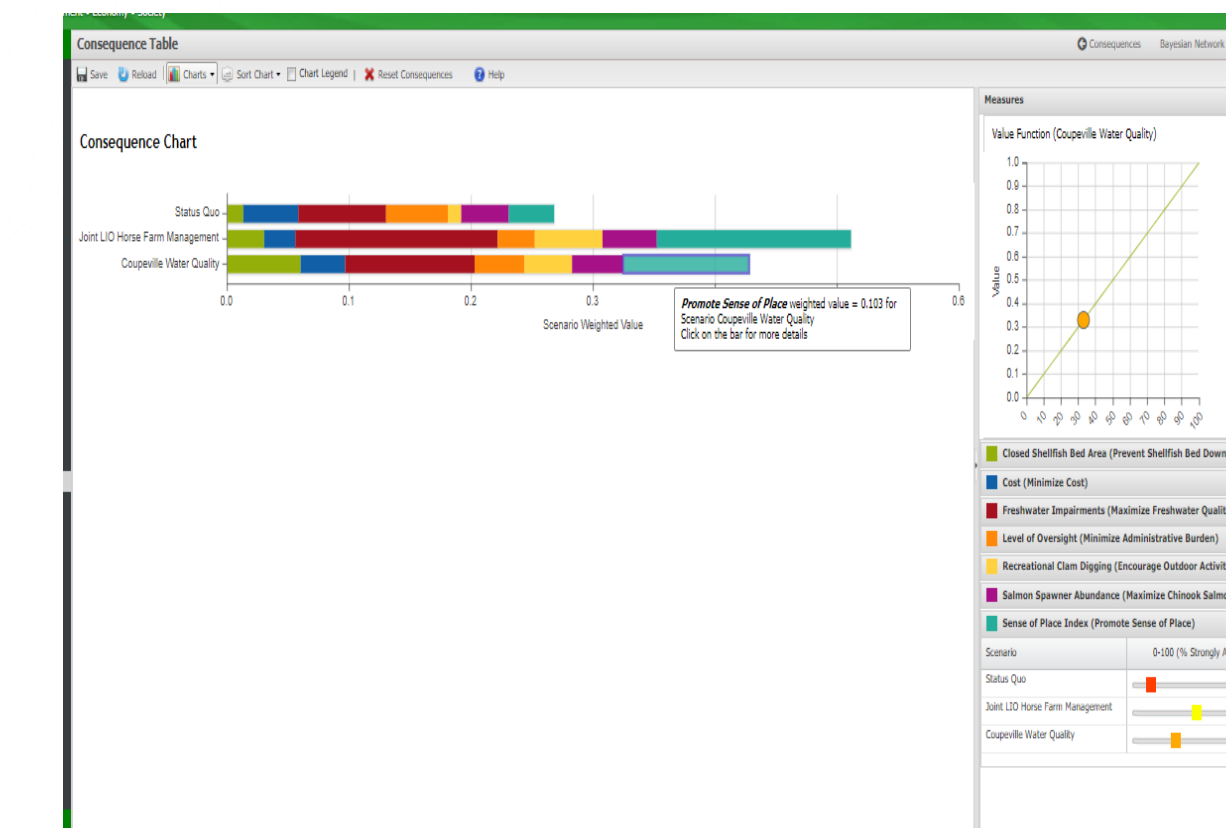
Develop Management Scenarios



DASEES has a default scenario "Status Quo" to compare proposed scenarios against current conditions. Each scenario has the options developed in Step 3, but with varying levels of effort or implementation.

Step 4: Evaluate Consequences

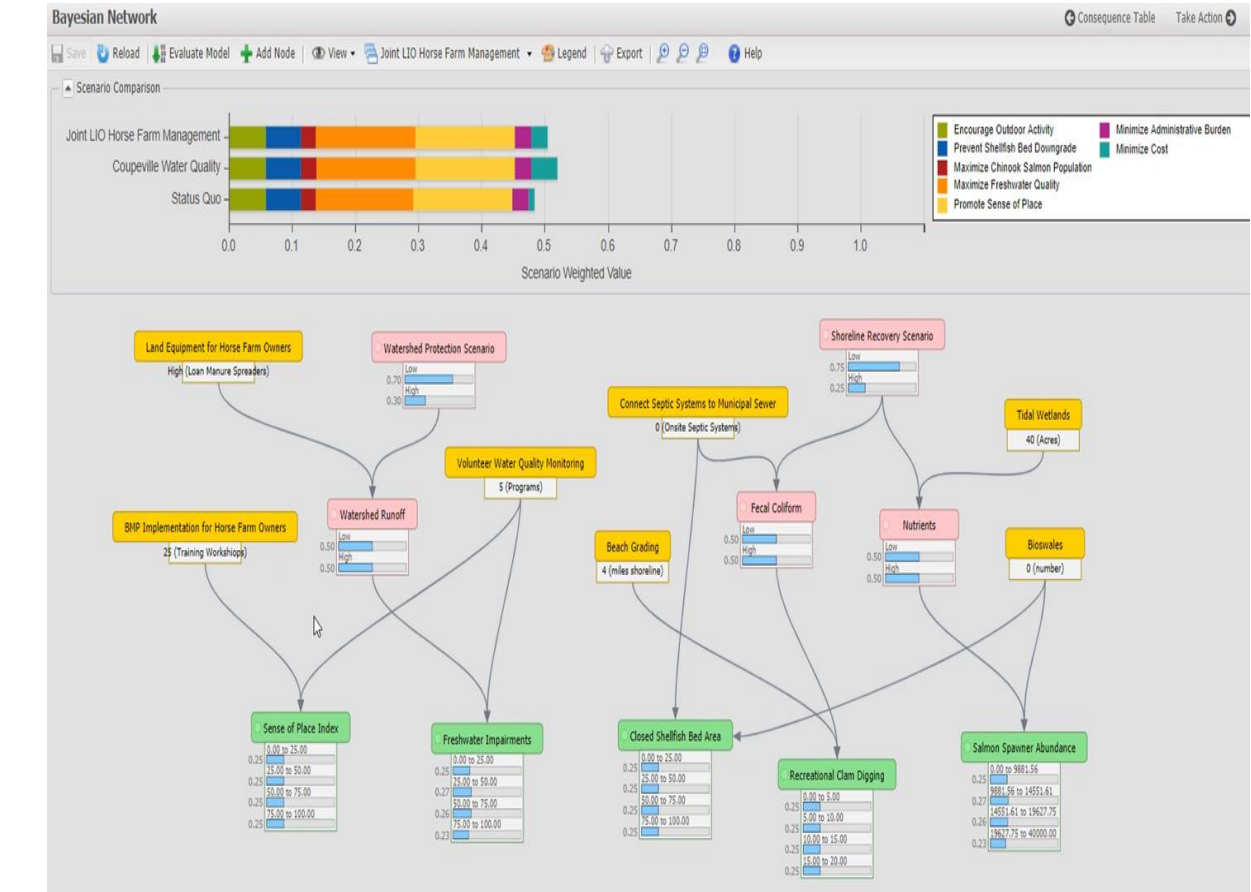
Consequence Table Rapid Analysis/Low Uncertainty



The consequence table is useful for simpler decision problems with negligible uncertainty or for rapid scenario analysis for screening out inferior scenarios.

The Consequence Chart (top bar chart) shows the aggregate value of measure results from option implementation for the status quo and the other two scenarios. Measure results are entered with sliders (right panel) and then converted to value with the value function (shown at top right). The sliders also allow for more exploratory "what if" analysis of possible results

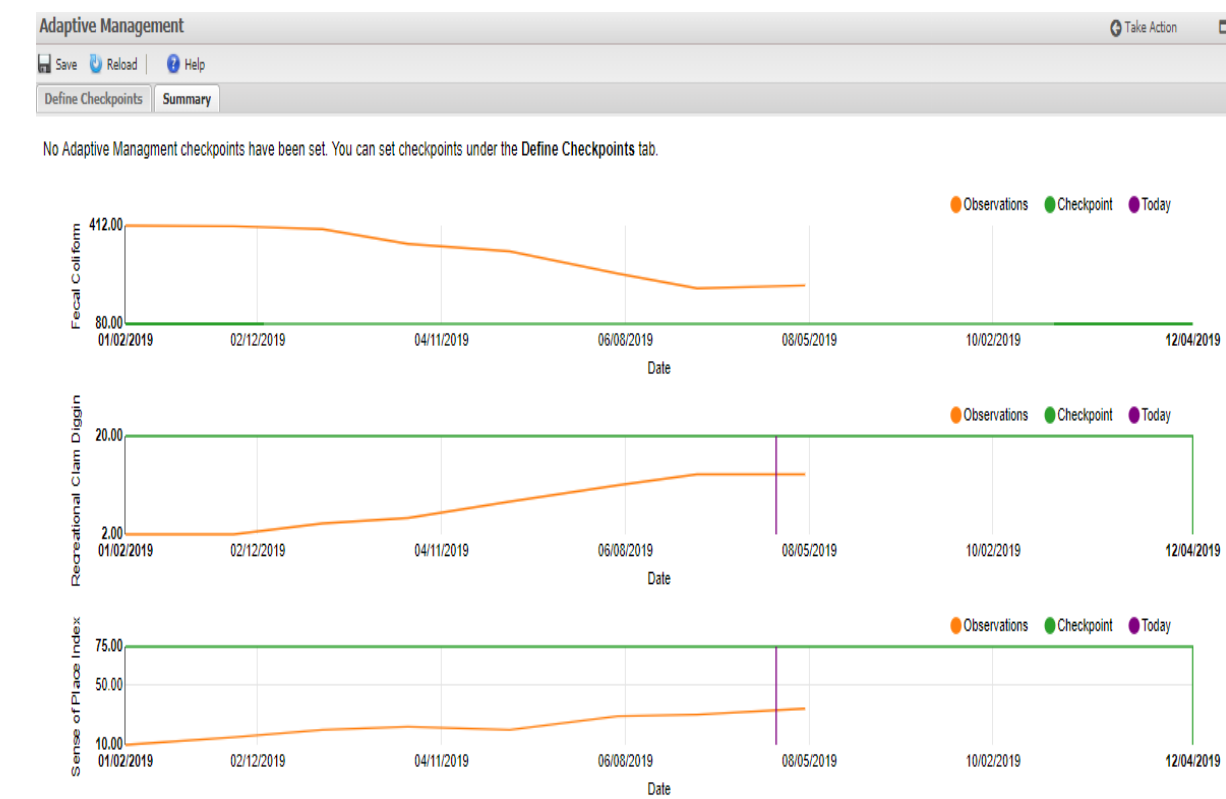
Initial Bayesian Network Probabilistic Graphical Model



Bayesian Networks use the same inputs as the consequence table (objectives, measures, options) but allows for establishment of causal mechanisms and quantification of the strength of those causal associations. This option is appropriate for decision problems with uncertainty in model variables. The uncertainties in the problem can be included in this assessment and examined for how this affects the decision.

Step 5: Take Action

Adaptive management



The last step in DASEES uses uploaded monitoring data to track changes in measures of interest following option implementation.

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This is a poster presentation and does not reflect EPA policy.

DASEES Approach

DASEES Function and Philosophy

- Web-based framework supporting stakeholder-driven group decision-making
- Organizes use of tools/data/information needed for decision
- Includes stakeholder perspectives and tools for analysis and evaluation



- Stakeholder Participation**
 - Concerns
 - Objectives
 - Measures
 - Policy
 - Regulatory Requirements
 - Options Development
- Assessment/Evaluation/Implementation**
 - Results from Studies (Field, Lab, Modeling)
 - DASEES Consequence Modeling
 - Aggregate Impact
 - Trade-off Analyses (Objective-specific impact)
 - Uncertainty Analyses

DASEES uses a five-step iterative process. Doing these steps in order is important. The qualitative (context, objectives, measures, and options) should occur before the quantitative (data collection and consequence assessment).