

# Expert Elicitation

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**Situation:**

- ▶ You have incomplete or inadequate data
- ▶ You're unsure of which models to use or how to parameterize them
- ▶ There are all kinds of other uncertainties
- ▶ You need to make a decision anyway

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**Expert elicitation to the rescue!**

- ▶ Good for informing decision-making when:
  - Empirical data are missing or incomplete
  - Uncertainties are large
  - More than one conceptual model can explain existing data
  - Technical judgments are needed to evaluate assumptions

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## Other benefits

- ▶ Can take advantage of integrated and contextual knowledge and understanding
- ▶ Generates buy-in, ownership
- ▶ Can be rapid, relatively low cost

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## History

- ▶ Legally defensible examples
  - ESA: listing species and critical habitat designation
  - CERCLA: ecological risk assessment
  - NRDA: injuries to resources
- ▶ Not necessarily legal-quality examples
  - State-level: identifying habitat acquisitions
  - Developing adaptation options

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## A few cautions

- ▶ If you're trying to quantify subjective judgment, you need a solid process
- ▶ Cutting corners leads to shoddy results
- ▶ Beware expert overconfidence and other common errors made by experts
- ▶ Won't solve political or value-dependent problems

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## General approach

- ▶ Pre-elicitation:
  - Define problem
  - Structure problem/question
  - ID and select experts
  - Develop protocol
  - Develop briefing book
- ▶ Elicitation (Individual or group)
  - Motivate and train experts
  - Encode judgments
  - Verify judgments
- ▶ Post-elicitation
  - Document it all

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## Climate change example: NEAFWA

- ▶ Northeast Association of Fish and Wildlife Agencies Regional Habitat Model
- ▶ Objective: map geographical variation in habitat vulnerability across 13 NE States
- ▶ Combined EE with formal modeling

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## NEAFWA model

- ▶ Six major elements
  - Assessment of vulnerability to climate change
  - Assessment of vulnerability to non-climate stressors
  - Interaction potential
  - Assessment of overall future vulnerability
  - Confidence evaluation
  - Narratives

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### NEAFWA process: panel formation

- ▶ 40 participants from states, feds, and NGOs
- ▶ Wildlife biologists, ecologists, habitat specialists, regulators
- ▶ Given education in likely future climates in NE, how species/systems already reacting

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### NEAFWA process: panel tasks

- ▶ Review and comment on draft model
- ▶ Help finalize model
- ▶ Participate in habitat work groups
- ▶ Review and critique model runs from Manomet
- ▶ Help produce consensus habitat VAs

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### Climate change example: Climate Ready Estuaries “EE-type exercise”

- ▶ Piloted in two locations: SF Bay, MA Bay
- ▶ Wanted qualitative judgments on:
  - Relative influences of physical and ecological variables that regulate key climate-sensitive processes
  - Sensitivities of influences under current and future climate change scenarios
  - Degree of confidence in judgments about relationships
  - Options for adaptation

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### Characterizing influences

- ▶ How well do we *understand* each influence?
  - Influence Types: Direct or Inverse
  - Influence Degrees: Proportional or Disproportional
- ▶ How *sensitive* is each influence?
  - Low Sensitivity: Disproportionately Weak Response
  - Medium Sensitivity: Proportionate Response
  - High Sensitivity: Disproportionately Strong Response
- ▶ What influences have the greatest relative impact on the endpoint? (*importance*)

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### CRE Process: panel formation

- ▶ Created 2 expert panels for each site:
  - community interactions group
  - sediment retention group
- ▶ 7 experts each, mix of academia, NGOs, feds
- ▶ Elicited opinions in a 2-day workshop

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### CRE Process: panel tasks

- ▶ Individually evaluate “straw dog” influence diagrams showing key process variables, interrelationships (influences)
  - characterized type, sensitivity of each influence
- ▶ Discuss as group, generated “consensus” diagrams
- ▶ ID most likely management options

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## CRE Conclusions

- ▶ Look at all types of information when analyzing management paths: influences, sensitivity, importance
- ▶ Based on expert judgment, can ID “top pathways” for which there are available adaptation options.
- ▶ Variation between participants was greater than between scenarios

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“The process of expert elicitation must never be approached as a routine procedure amenable to cookbook solutions ... Each elicitation problem should be considered a special case and be dealt with carefully on its own terms.”

Morgan and Henrion 1990

*And yet ...*

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## Commonalities

- ▶ Capture expert assumptions, thought process
  - NEAFWA: Excel model
  - CRE: influence diagrams
- ▶ Evaluate confidence
  - NEAFWA: condensed 5-point IPCC scale to 3
  - CRE: reflect agreement and availability of evidence
- ▶ Focus on transparency

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