



# Problem Definition

## PrOACT

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ALC3171 Introduction to Structured Decision Making  
Module 4

Angela Romito, *USFWS Southeastern Regional Office*

Jean Fitts Cochrane, *Grand Marais Consulting (USFWS Retired)*

Mitch Eaton, *USGS DOI Southeast Climate Science Center*

Michael C. Runge, *USGS Patuxent Wildlife Research Center*



# Module Objectives:

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- ❖ Understand the importance of:
  - clearly defining the problem to be addressed
  - how the decision statement guides the rest of the SDM process
- ❖ Identify the essential components of a decision statement
- ❖ ID the primary decision impediment –  
What makes your decision hard?



# Problem Definition

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- ❖ The first, and arguably the most important, task in SDM is developing a decision statement
- ❖ Determines which objectives are relevant to the decision context and, later, which alternatives are available for achieving objectives.
- ❖ Provides an *a priori*, explicit, and shared understanding of the problem at hand
- ❖ Sets bounds on the problem by identifying spatial, temporal, organizational, legal, and other relevant bounds



# Problem Definition

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*“A good solution to a well-posed decision problem is almost always a smarter choice than an excellent solution to a poorly posed one.”*

~ Ralph Keeney



# Too Often...

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- ❖ Decision makers naturally jump to thinking about alternatives
- ❖ We assume the problem has defined itself so we don't frame the problem or think about what we *really* want to achieve
- ❖ Alternative focused thinking → narrow problem framing → omission of important objectives and the means of achieving those objectives

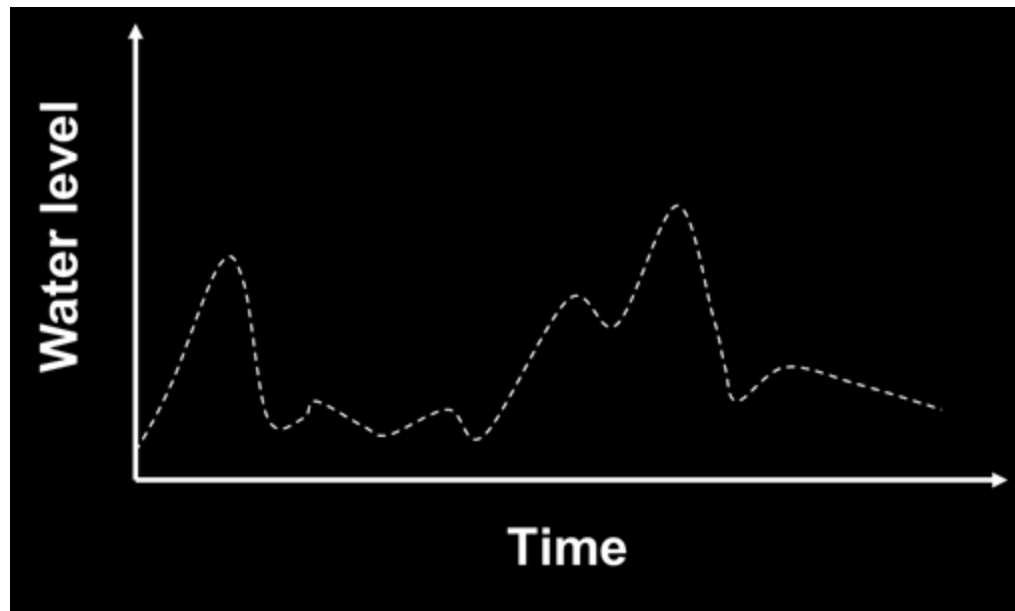
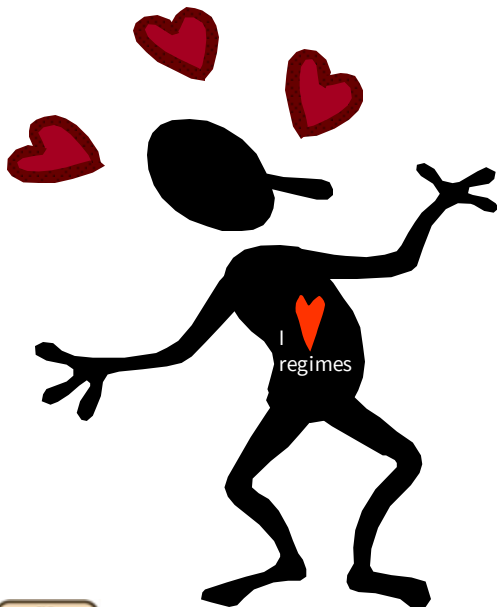


# The Dangers of Alternative-Focused Thinking

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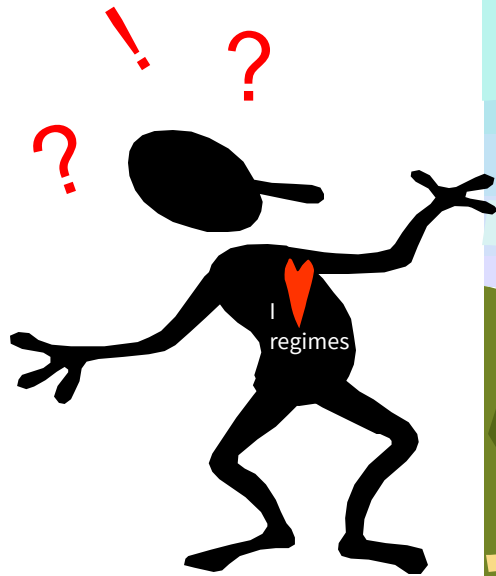
## Example:

Fishery manager states that, “We must restore hydrologic regime.” This implies that the most important (fundamental) objective is restoring natural flows.



# The Dangers of Alternative-Focused Thinking

**Possible outcome:** The flow regime is natural but...  
*all the fish are dead*



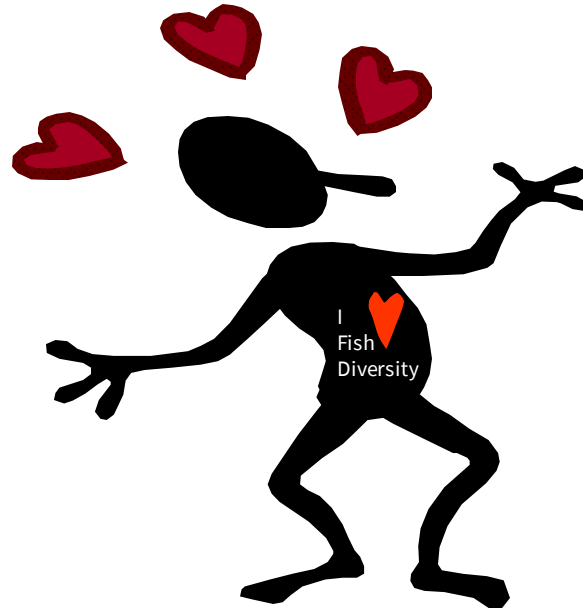
# Value-Focused Thinking Leads to Greater Creativity

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Translocate

Restore  
spawning habitat

Modify  
flow regime



Create  
fish passage

Harvest  
restrictions

Remove  
invasive competitors





# Defining Problems as Decisions

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Making **decisions** *is* the **problem**

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- ❖ Management problems are often made more difficult (murky) when we fail to realize that the problem revolves around a *decision*
- ❖ Deciding between a finite set of alternative courses of action should be the focus of problem solving (i.e. decision making)



# Decision Statements

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- ❖ Should reflect values, not just technical or scientific aspects of a decision.
- ❖ Values and issues may be:
  - Economic
  - Political
  - Cultural
  - Legal
  - Etc.



# Elements of Problem Framing

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1. Identify the decision maker(s)
2. Identify other key players
  - Decision implementers & stakeholders
  - Technical experts, facilitators
3. Consider legal and regulatory contexts
4. Consider the decision structure
  - Timing, frequency, temporal and spatial scale, objectives, constraints, and actions
5. Consider the type of analysis required
6. Revise as needed



# 1) ID the Decision Maker(s)

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## ❖ Who has the authority to commit to action?

- Can be a surprisingly difficult question

## ❖ Some scenarios

- Single decision-maker
  - Possibly with interested stakeholders
- Multiple decision-makers
  - Willing to work together for joint aims
  - Competing with each other
- Delegated authority
  - E.g., Secretary → Director → Reg. Director
- Contested authority for the decision

## ❖ Failure to ID & include all DMs in the process will very likely lead to failure



## 2) ID other Key Players

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### ❖ Decision Implementers

- Will entities without decision-making authority be responsible for implementing decisions?

### ❖ Stakeholders

### ❖ The public

### ❖ Technical advisors

### ❖ Facilitators

### ❖ Decision Coaches



# Decision Makers vs. Stakeholders

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- ❖ DMs have the authority and resources to implement the decision action
- ❖ DMs have greater responsibility and accountability than stakeholders





# Who *could* be a Stakeholder?

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- ❖ Any person or organization with a vested interest in the outcomes of a decision
- ❖ For personal decisions:
  - e.g., Building a house: partner, in-laws, property-owner (neighbor), finance, children, neighbors (if new construction), etc...
- ❖ Examples of other personal decisions and stakeholders?



# Who *could* be a Stakeholder?

- ❖ Any person or organization with a vested interest in the outcomes of a decision
- ❖ For natural resource management decisions:
  - Consumers/users (e.g. hunters, anglers, hikers, boaters...)
  - Public management agencies (e.g. FWS, EPA, state agencies)
  - Non-governmental organizations (e.g. Nature Conservancy)
  - Political (e.g. federal, state, local officials)
  - Economic (e.g. businesses, chamber of commerce)





# 3) Consider the Legal & Regulatory Context

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## ❖ Particularly for decisions by public agencies

- What enabling legislation confers authority for the decision?
- How does the legislation or associated regulations bound the decision problems?

- Objectives
- Constraints
- Set of choices



# 4) Consider the Decision Structure

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- ❖ **Frequency & Timing** - How often will the decision be made? When? Are other decisions linked to this one?
- ❖ **Scope** - How large, broad, complicated is the problem/decision? Single or multiple objectives? Conflicting objectives?
- ❖ **Objectives** – Roughly, what are the desired outcomes? Is there 1 primary objective or many?
- ❖ **Actions** – Roughly, what kinds of alternatives are being chosen from?
- ❖ **Constraints** - Legal, financial, political, 'minimum performance'. Perceived or real constraints?
- ❖ **Uncertainty** - What degree of uncertainty is present? Can it be ignored?



# 5) Consider the Type of Analysis Required

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- ❖ In order to choose among alternatives, what sort of analysis will be required?
  - How much detail is needed?
  - What class of decision problem (i.e., jellyfish) do you have?



- ❖ Do the data and analytical methods exist?
- ❖ Do you have access to the expertise?
- ❖ Is uncertainty a fundamental impediment?

## 6) Revise as Needed

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- ❖ Problem framing is one of the most difficult steps. Difficult to get it right the 1<sup>st</sup> time...
- ❖ As you proceed with the decision analysis, insights are likely to arise that cause you to rethink the very nature of the decision itself. Be open to these insights.
- ❖ The problem definition is likely to change as you proceed with development.
- ❖ Adopt iterative prototyping as an approach to development of a decision analysis



# Classes of Decision Problems

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- ❖ Certain decision structures appear again and again
- ❖ Being able to recognize these classes of decision problems helps structure the problem and identify analytical tools

## 6 Classes of Decisions

- 1) Prediction Problems
- 2) Multiple Objective problems
- 3) Portfolio Problems
- 4) Risk Problems
- 5) Information Problems
- 6) Dynamic Problems



# Developing a Decision Statement

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- ❖ It's often very useful, early in the process, to frame the problem in the form of a problem statement
  - About a paragraph long (or sometimes a very long, run-on sentence)
  - Captures the essential outline of the problem
  - Helps participants focus
  - Reframes a vague task as a decision to be solved



# Construct Your Statement by...

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Answering the following questions:

- **Decision Maker** – Who will make the decision?
- **Trigger** – Why does a decision need to be made? Why does it matter?
- **Action** – What is the decision? What action needs to be taken?
- **Constraints** – legal, financial, political? Are these perceived or real?
- **Frequency and Timing** – Periodicity of decision. Are other decisions linked to this one?
- **Scope** – How broad or complicated is the decision?
- **'Class' or Type of Decision Problem** – Which of the six classes does the decision fall into? What are the impediments to making the decision?



# Construct Your Statement by...

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Using the following template:

“Decision Maker (**D**) is trying to do **X** to achieve **Y** over time **Z** and in place **W** considering **B**.”

where,

**D** = the Decision maker(s)

**X** = the type(s) of action that needs to be taken

**Y** = the ultimate goal(s) to be achieved by “X”

**Z** = the temporal extent of the decision problem.

**W** = the spatial extent of the decision problem

**B** = potential constraints (legal, financial, and political) and important uncertainties (scientific or other)





# Decision Statement – Example

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## Brown Bear Decision Statement: **Action**

*“Manage habitat and consumptive and non-consumptive use of brown bears for current and future generations on Katmai NP and Preserve and Noatak NP to maintain populations, species assemblages, and ecosystem processes recognizing 1) natural variation, 2) subsistence harvest, 3) deference to non-conflicting state harvest regulations, and 4) realizing that bear populations extend beyond park boundaries.”*



# Decision Statement – Example

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## SW Alaska & Arctic National Park Network Brown Bear Decision Statement

*“Manage habitat and consumptive and non-consumptive use of brown bears for current and future generations on Katmai NP and Preserve and Noatak NP to maintain populations, species assemblages, and ecosystem processes recognizing 1) natural variation, 2) subsistence harvest, 3) deference to non-conflicting state harvest regulations, and 4) realizing that bear populations extend beyond park boundaries.”*



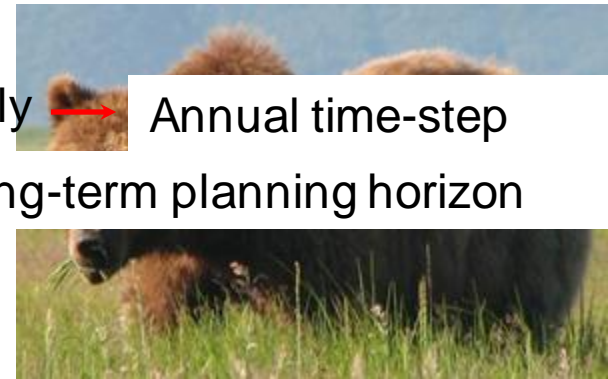
# Decision Statement – Example

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## Brown Bear Decision Statement: Temporal Extent

*“Manage habitat and **consumptive** and non-consumptive use of brown bears for current and **future generations** on Katmai NP and Preserve and Noatak NP to maintain populations, species assemblages, and ecosystem processes recognizing 1) natural variation, 2) subsistence harvest, 3) deference to non-conflicting state harvest regulations, and 4) realizing that bear populations extend beyond park boundaries.”*

Consumptive use → Harvest decisions made annually → Annual time-step  
Future generations → Implies sustainability → Long-term planning horizon



# Decision Statement – Example

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## Brown Bear Decision Statement: **Spatial Extent**

*“Manage habitat and consumptive and non-consumptive use of brown bears for current and future generations on **Katmai NP and Preserve and Noatak NP** to maintain populations, species assemblages, and ecosystem processes recognizing 1) natural variation, 2) subsistence harvest, 3) deference to non-conflicting state harvest regulations, and 4) realizing that bear populations extend beyond park boundaries.”*

Katmai NP & P  Coastal-dwelling bears

Noatak NP  Interior-dwelling bears



# Decision Statement – Example

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## Brown Bear Decision Statement: Constraints

*“Manage habitat and consumptive and non-consumptive use of brown bears for current and future generations on Katmai NP and Preserve and Noatak NP to maintain populations, species assemblages, and ecosystem processes recognizing 1) natural variation, 2) **subsistence harvest**, 3) **deference to non-conflicting state harvest regulations**, and 4) realizing that **bear populations extend beyond park boundaries.**”*

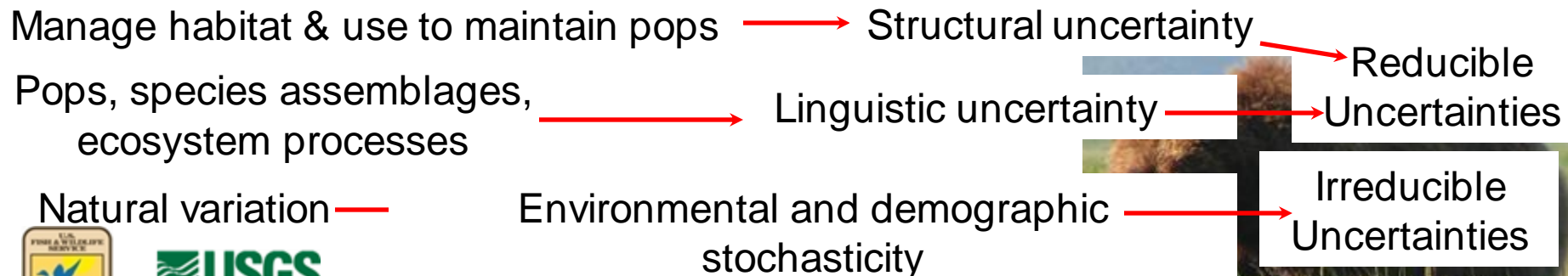
2 & 3      Statutory constraints  
4      Jurisdictional constraint



# Decision Statement – Example

## Brown Bear Decision Statement: **Uncertainty**

*“**Manage** habitat and consumptive and non-consumptive use of brown bears for current and future generations on Katmai NP and Preserve and Noatak NP to **maintain populations, species assemblages, and ecosystem processes** recognizing 1) **natural variation**, 2) subsistence harvest, 3) deference to non-conflicting state harvest regulations, and 4) realizing that bear populations extend beyond park boundaries.”*





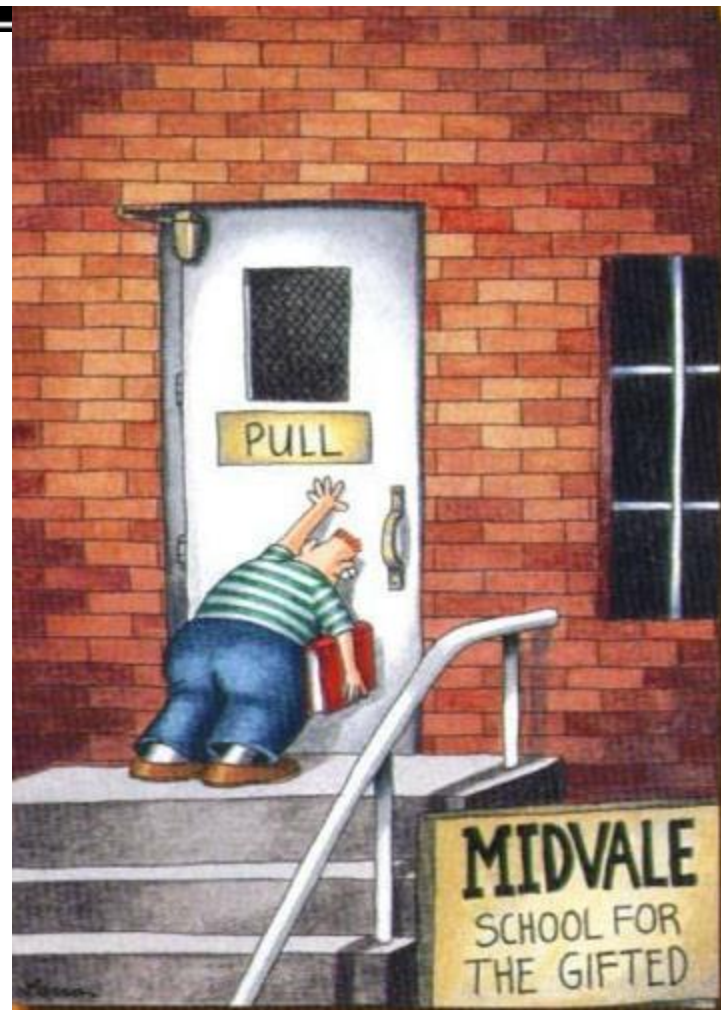
# Avoid Common Pitfalls

## “Frame Blindness”

- ❖ Are there other perspectives that aren't being considered?
- ❖ Are any perceived constraints imaginary?
- ❖ Are we biased by earlier actions, successes, or failures?
- ❖ Are we making any false assumptions?

If we answered “yes” to any of these, we may be incorrectly framing the problem.

Are we solving the **right problem** and is our **scope** correct?



# Decision Framing is Hard

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It's worth taking the time to get it right...

*“A good solution to a well-posed decision problem is almost always a smarter choice than an excellent solution to a poorly posed one.” ~ Ralph Keeney*

*“Never enough time to do it right...  
always enough time to do it over” ~ Anon.*

