

## Module B — Problem Definition

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# PrOACT

At the end of this module, you'll be able to:

- Outline the steps for developing a useful problem statement
- Preview the suite of SDM tools associated with problem “classes”
- Look at some of the pitfalls of poorly defined problem statements
- Practice reviewing and revising a short problem statement

Human Nature: Assuming the problem has defined itself and moving straight into Alternatives (or Objectives)

Problem definition is the foundation of SDM and often one of the hardest steps in the process.

SDM is Values Driven

- Problems are not simply technical or scientific
- Decision statements reflect societal values: scientific, economic, political, cultural, etc.
- A well-defined problem might take multiple attempts. It may need to be constructed from working on the problem.
  - You may have to ‘go around some loops’ of SDM before the issues are fully clear.

Problem Definition Steps:

- 1) Defining problems as decisions
- 2) Solving the right problem
- 3) Careful framing of the problem
- 4) Develop a problem statement
- 5) Revise as needed

**Problem Definition**  
***An Overview of Structured Decision Making***

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## 1) Defining Problems as Decisions

“Problems” are actually decisions. Making these **decisions** is the **problem** we contend with.

Decision defined:

- “An outcome of a cognitive process leading to the selection of a course of action among several alternatives”
- “An irrevocable allocation of resources...not a mental commitment to follow a course of action but rather the actual pursuit of the course of action” (Howard 1966)

Decision  Problem

Examples:

Problem: “My son is acting up”

Decision statement: “How can we improve my son’s anti-social behavior?”

Problem: “We face competing interests between the public and conservation goals for wetland bird populations and habitat”

Decision Statement: “How to optimize management of wetland habitat for bird populations given multiple and competing objectives”

## 2) Solving the right problem

Is the problem, as stated, within our ability to solve? Is it tractable?

Intractable Problems:

- Have already been decided; out of ‘our’ control
- Require a greater level of investment than available
  - Time,
  - Personnel
  - Budget, etc

Failure is highly probable unless we re-define the problem so that it is within our ability to solve

- **Who is the Decision Maker?** Who is ultimately responsible?
  - Single decision maker
  - Multiple decision makers
  - Delegated authority
  
- Stakeholders are not decision makers

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---

3) Framing the problem: essential elements of the decision

- **Trigger** – What triggered the problem? Why does a decision need to be made?
- **Action** – What is the decision? What action needs to be taken? What action needs to be taken *now*?  
(remember: *no* action is a decision)
- **Frequency & Timing** – When and how often will the decision be made? Are other decisions linked to this one?
- **Scope** – How large, broad, complicated is the problem/decision?
- **Constraints** – Legal, financial, political, ‘minimum performance’. Perceived or real constraints? Be creative
- **Uncertainty** – What degree of uncertainty is present? Can it be ignored?
- **Problem ‘Class’** – Characterizing the type of problem helps determine what decision-making tool(s) to use. Single or multiple objective? How critical is uncertainty?

**Tool: Problem Class Matrix**

<i>DECISION MAKING TOOLKIT</i>	<i>NO UNCERTAINTY</i>	<i>WITH UNCERTAINTY</i>
<i>SINGLE OBJECTIVE</i>		
<i>MULTIPLE OBJECTIVES</i>		

**Pitfall: “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?

-Revisit the problem statement with these questions. Are we solving the **right problem** and is our **scope** correct? Is the problem **tractable**?

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#### 4) Developing a problem statement

- Be explicit – don't assume problem is obvious; clearly document the problem statement
- Address all perceived constraints and assumptions
- Construct your statement
  - **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 problem** – how many objectives? Do they conflict? What is the level of uncertainty and how critical is it?
- Problem statement should only include the salient details. Include a *brief* background on:
  - Legal, regulatory, political issues
  - Ecological issues

#### 5) Revise as needed

- Defining the problem is often the most difficult step. We often do not get it right the first time around.
- As you proceed with the decision analysis, insights are likely to arise that cause you to rethink the nature of the decision. 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.

*“Extra time to craft a concise yet comprehensive and accurate problem definition pays off...”* – Smart Choices

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**Is this a useful problem statement? What is missing, if anything?**

**Rolling Thunder NWR Vegetation Management Problem Statement**

*Initial version:*

In response to a petition for listing under section 4 of the Endangered Species Act, the *midget prairie skipper butterfly* and *burying grass beetle* are now listed as threatened species. These newly listed species are endemic to prairies on and near the Rolling Thunder National Wildlife Refuge. Grassland management on the refuge has been criticized for not protecting these invertebrates adequately. Maintaining viable grasslands is critical to the survival and recovery of the species. Grasslands at Rolling Thunder NWR have been burned on a prescription rotation basis for over 25 years. Now the use of fire is challenged by invertebrate biologists and controversial with local landowners, despite the success of burning in controlling woody species invasion and helping prairie orchids and other fire-adapted plants. The refuge is struggling to determine whether and how to continue using prescribed fire or what substitutes for fire could be used for vegetation management. The refuge also supports cattle grazing on some fields, which is popular with local ranchers and would be difficult to stop without economic compensation. Mowing is a possible vegetation management strategy but it may not be practical or cost effective. To address this problem, we want to use a structured decision-making process as a tool to work through and address the issues associated with developing a grassland management plan.

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**Exercise: Rolling Thunder NWR Vegetation Management**

**Rolling Thunder NWR Vegetation Management Problem Statement**

*Comprehensive, succinct version:*

- [1] What is the decision—what kind of action needs to be taken?**
- [2] What triggered this decision; why does it matter?**
- [3] What are the legal context and constraints?**
- [4] Who is the decision maker?**
- [5] What is the decision timing and frequency; are other decisions linked to this one?**
- [6] What is the scope of the problem (how broad or complicated is it)?**

**[1]** A revised program of vegetation treatment needs to be implemented for Rolling Thunder NWR that achieves recovery goals for protected prairie-endemic species.

**[2]** Recently, refuge conservation objectives expanded to include sustaining newly listed butterfly and beetle populations. These species may be harmed by some grassland management practices, particularly prescribed burning that has been used for 25 years to control woody species invasion and benefit rare plant populations.

**[3]** The new program will become part of a multi-species recovery plan to meet ESA requirements, and will also have to comply with the NWR Administration Act and NEPA. Management options may be constrained by nearby residential development and local opposition to prescribed fires; also local ranchers expect economic benefits from grazing cattle on the refuge. **[4]** The refuge manager must decide on a

treatment program, in consultation with the species recovery team. **[5]** The program must be in place by the summer and will last for five years. Some of the treatments may restrict future management options for up to 10 years, because of infrastructure commitments and ecological effects. **[6]** While the vegetation management strategy technically only applies to grasslands on about half of this refuge for a five-year program, the decision is considered critical for sustaining these endemic prairie species throughout their limited ranges.