



Avoid Common Pitfalls of Monitoring: Link Monitoring To Management



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Why am I interested in monitoring?

- Experience with monitoring birds, frogs, and plants
- FWS Biological Monitoring Team
 - FWS I&M Policy Team
 - Adaptive management projects
 - Monitoring symposium, TWS 2006
- Long Term Resource Monitoring Program on the Upper Mississippi River



When planning a regional monitoring program...

- Consider first what you are trying to accomplish (objectives).
- Link monitoring to management & policy decisions.
- Integrate monitoring for research, surveillance, and adaptive management.



The great divide

The gap between theory and practice remains surprisingly wide in conservation biology.

“What is needed is a concerted effort by both academic scientists and practitioners to get out of their respective ruts, open up paths of communication, share information and seek ever more efficient means to a common end.”

Nature 2007



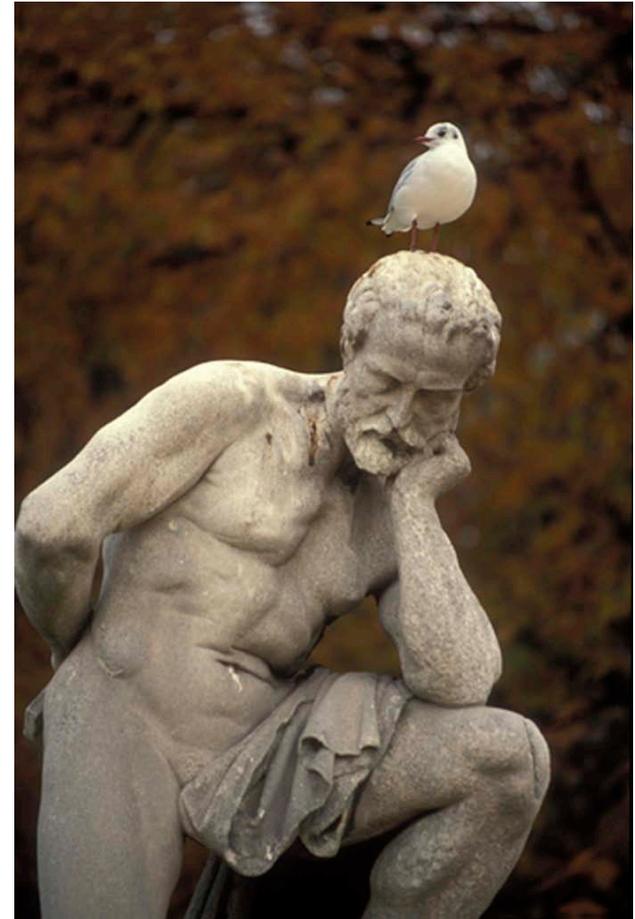
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Pitfalls of Monitoring



Pitfall: Avoid Objectives

- Naked monitoring
 - Avoid objectives, ignore management decisions, focus mainly on what to monitor
- Objectives -What are we trying to accomplish?
- Why are we monitoring X?
- What is the decision making framework for the problem?
- When should we stop monitoring?



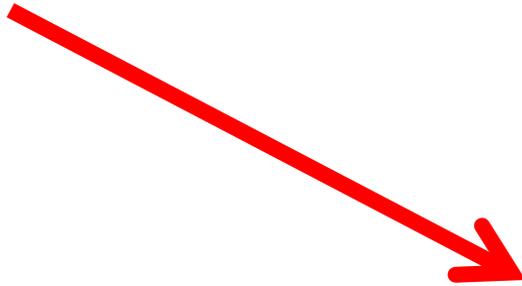
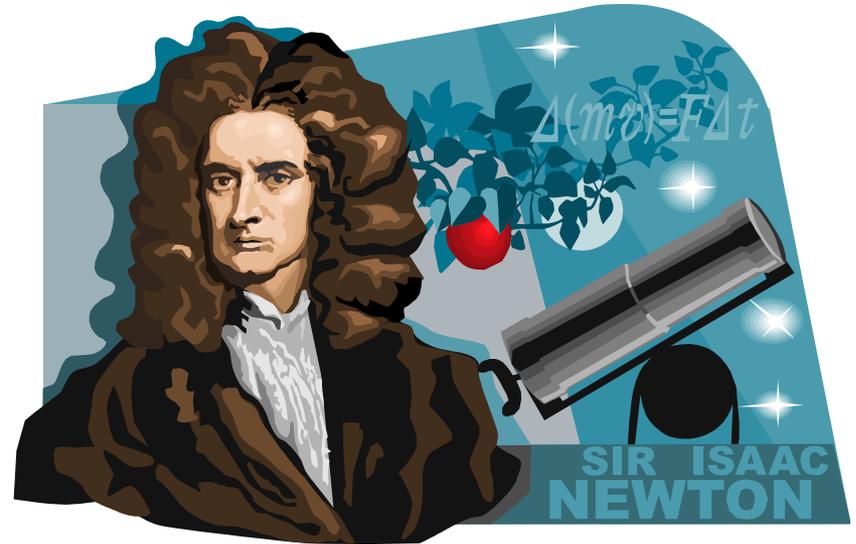
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Pitfall: Time, Resource, and Expertise Constraints

- Faulty sampling design → what does it all mean?
- No time to analyze data
- No time to interpret data
- Inconsistent archiving



Pitfall: Costs Exceed Benefits

- A robust monitoring program is expensive
 - Design & plan
 - Implement
 - Analyze & interpret
 - Archive & serve data
 - Revise program
- FWS Inventory & Monitoring Policy
- Over time, declining interest erodes funding



Pitfall: Structural Issues

- Stovepipe Syndrome - failure to integrate monitoring, research, management
 - Significant trend...**Surveillance**
 - What's causing it; is it a problem?....**Research**
 - Can we do anything about it?.. **Management**
- Difficulty revising sampling designs & metrics in light of new information



Avoid pitfalls, plan ahead!

- **Why** you want to monitor X?
- What information will help you make 'smart' management decisions?
- Form follows function...
 - Sampling designs
 - Monitoring metrics
 - Interpretation
 - Databases
 - Presentation & dissemination of information



Avoid pitfalls, plan ahead!

- Budget for all phases of monitoring
- Collaborate with experts in sampling design, statistical analysis, & data management
- Plan for periodic revisions of the monitoring program
- Emphasize interpretation of the data and making it useful to policy and decision makers



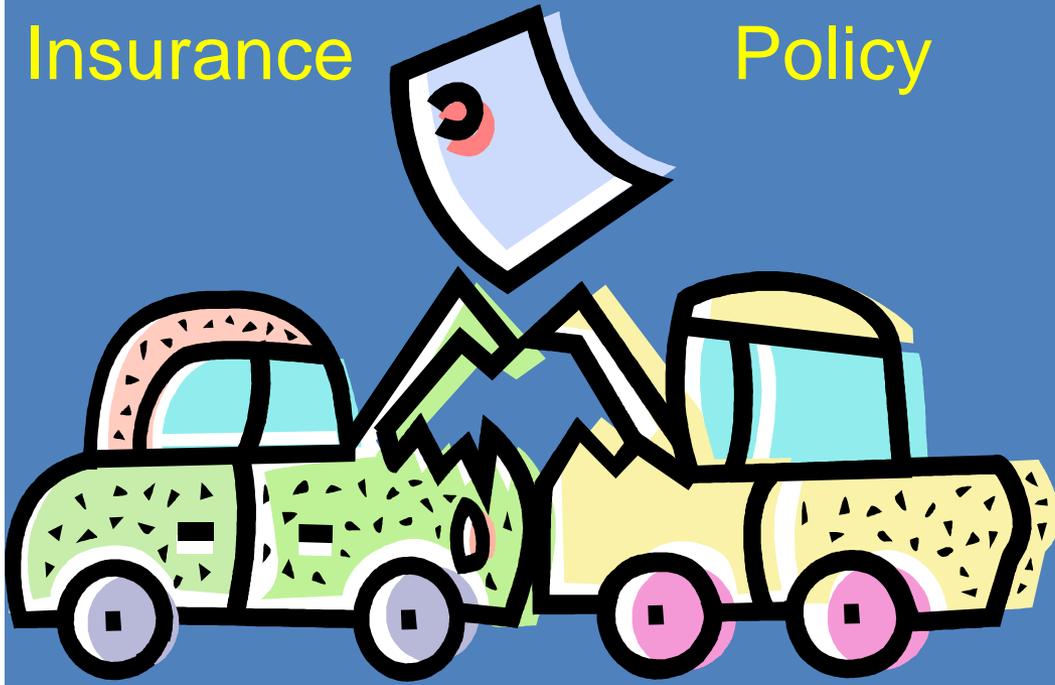
Avoid pitfalls, plan ahead!

Relevance to Decision Makers

- Budget for all phases of monitoring

Insurance

Policy



sampling
an
f th
the de
d decision makers



Monitoring Within a Decision Making Framework

- Structured Decision Making (SDM)
- Adaptive Management



Structured Decision Making is..

“A formal application of common sense for situations too complex for the informal use of common sense.”

R. Keeney

Benefits

- Documentation
- Accountability
- Transparency



Steps in the SDM Process

- **Problem**
- **Objectives**
- **Alternatives**
- **Consequences**
- **Tradeoffs**

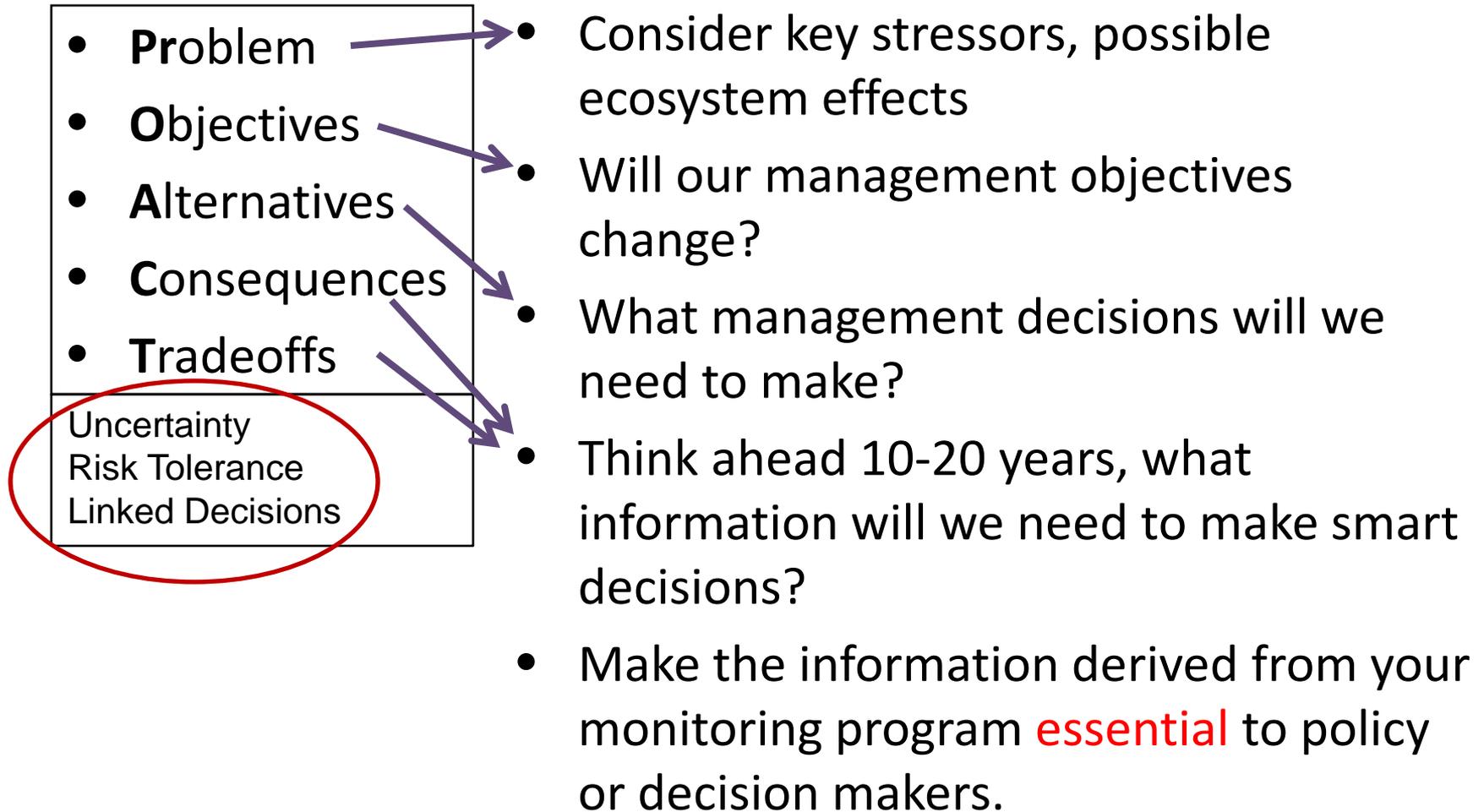
Contrast with intuition, which starts by debating the alternatives



Uncertainty
Risk Tolerance
Linked Decisions



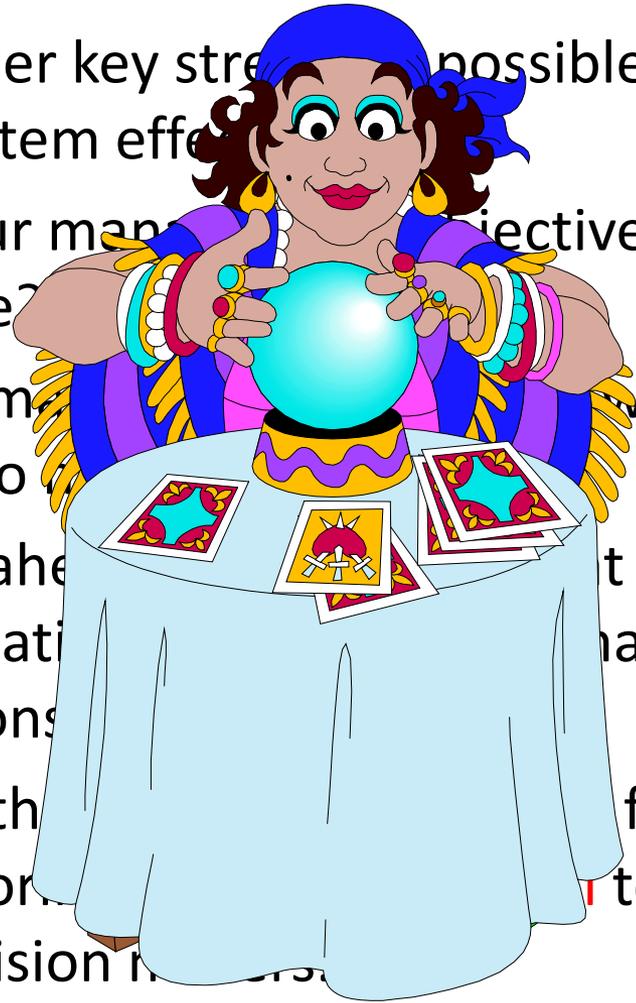
Monitoring Within a Decision Making Framework



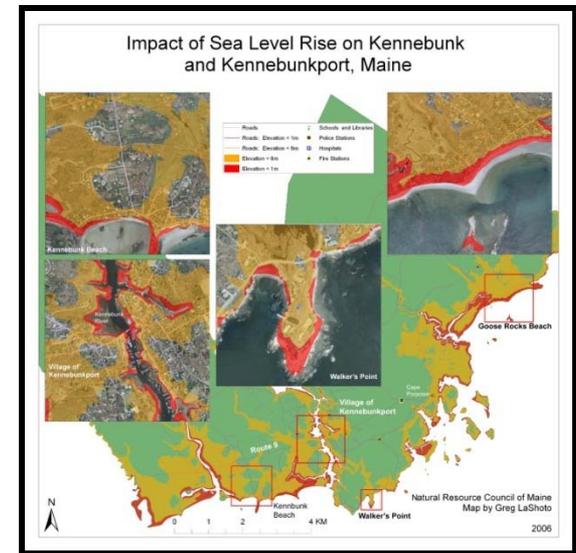
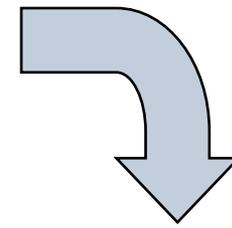
Monitoring Within a Decision Making Framework

- Problem
 - Objectives
 - Alternatives
 - Consequences
 - Tradeoffs
- Uncertainty
Risk Tolerance
Linked Decisions

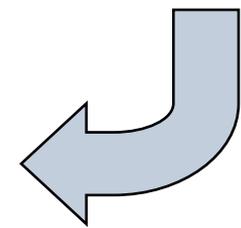
- Consider key stressors and possible ecosystem effects
- Will our management objectives change?
- What management actions will we need to take?
- Think ahead: How can we get the information we need to make smart decisions?
- Make the most of what you know from your monitoring and adapt to policy or decision needs



Strategic Habitat Conservation



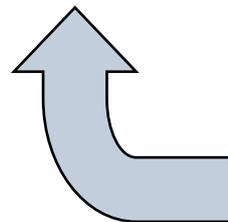
Conservation Design



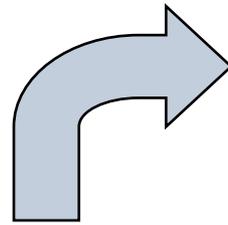
Biological Planning



Management



Monitoring & Research

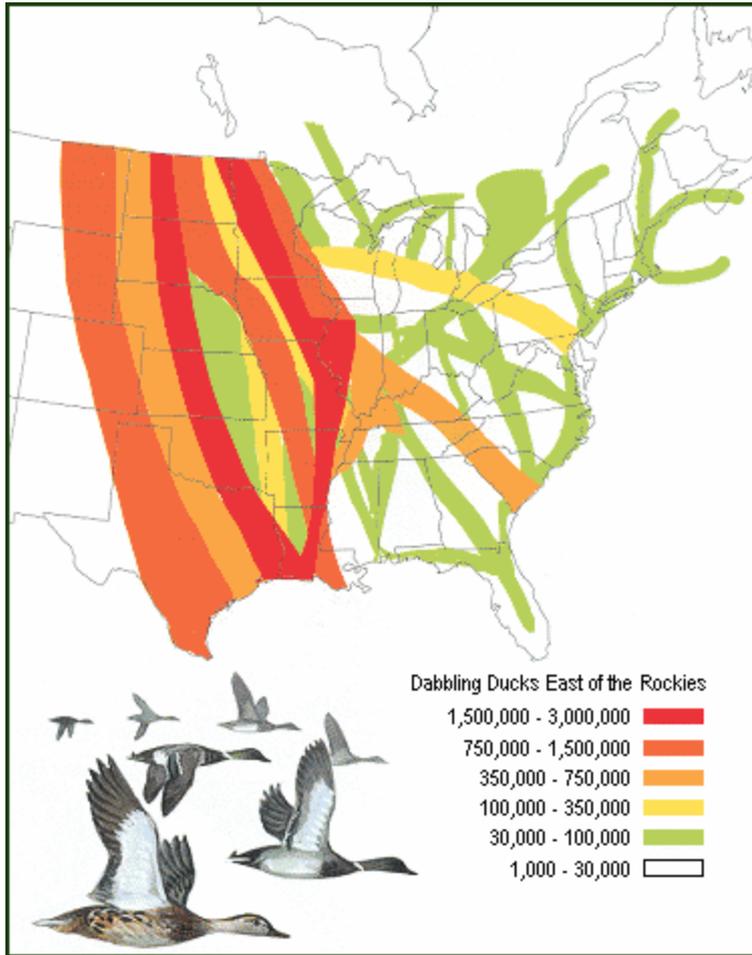


Example: Waterbird Conservation & Monitoring

- FWS Regions 3, 4, 5 (Mississippi River → east)
- Strategic Habitat Conservation = Landscape Scale Conservation



Integrated conservation of waterbirds during migration: decisions



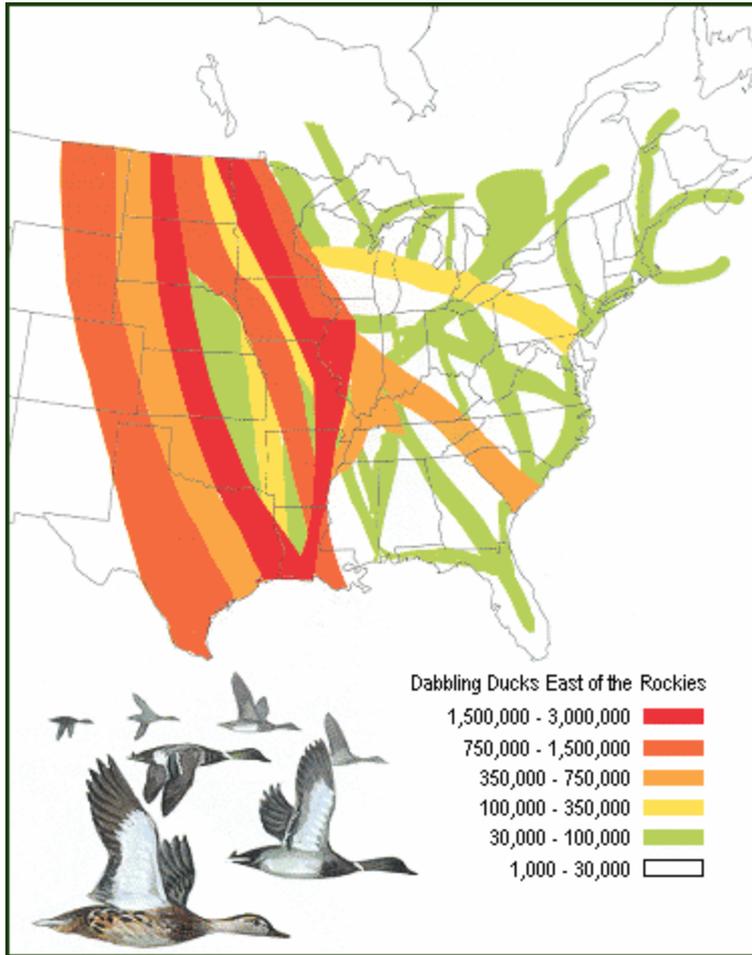
Problem:

- Monitoring of waterbirds during migration is uncoordinated; we need a standardized protocol so that everyone does it the same.
- Monitoring data are scattered, we need a way to organize the data.
- We want to know how the birds are using the refuges.
- We need enough habitat to support populations during migration.
- It's part of the mission of the FWS to support migratory waterbird populations.



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Key Management Decisions



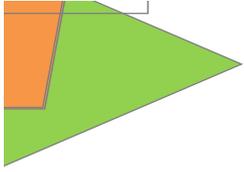
Flyway: when,
where, how much
habitat?

Local: Optimal
management
strategies

Region: Optimal
allocation of
funds among
stations

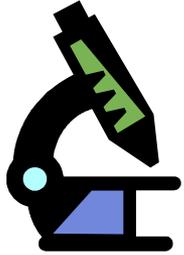


Monitoring Linked to Decisions at Three Spatial Scales



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Research



Understanding
Ecological
Systems

Surveillance



Status and trends

Phenology

Monitoring

Reduce
uncertainty

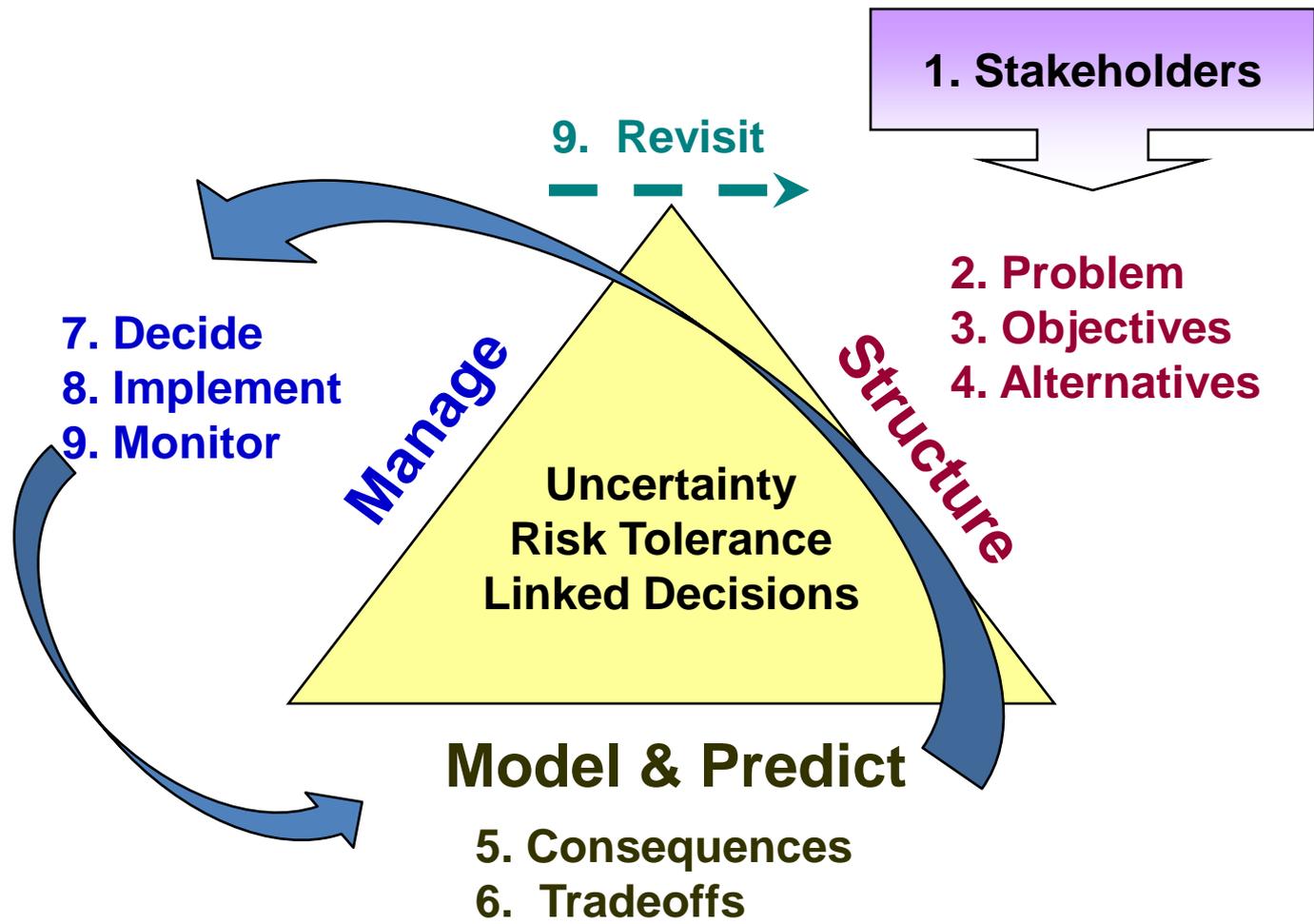


Adaptive Management

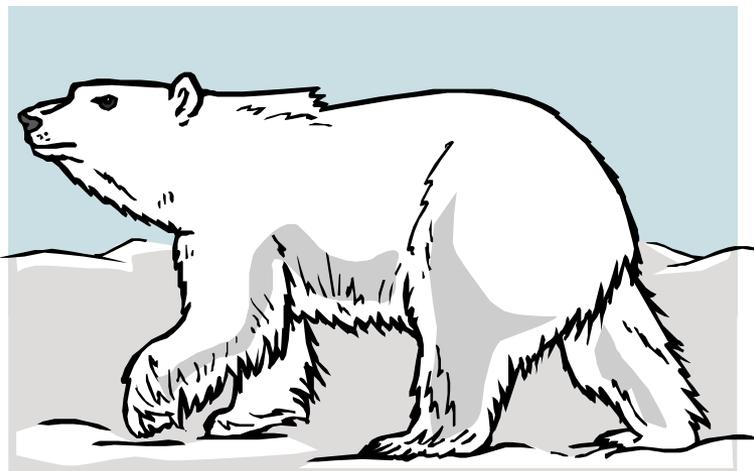


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Adaptive Management Process



Management uncertainty grows as the climate changes



Policy & Management Decisions

- Hunting seasons & bag limits
- Road closures
- New road, powerline construction
- Fishing regulations
- Predator control
- Prescribed fire
- Exotic plant removal
- Management of 'refugia' – landscape connections
- Assisted migration
- Habitat management
- Policy decisions – financial incentives, laws, regulations



Research



INTEGRATE



Surveillance

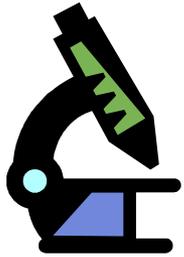


Adaptive Management



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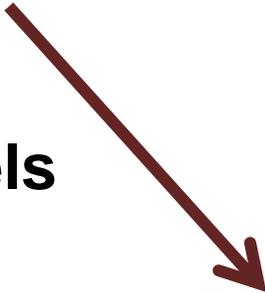
Research



Metrics, Monitoring Tools
Ecosystem Processes



Models



Surveillance

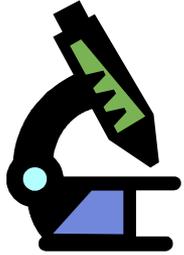


Adaptive Management



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Research



Surveillance



Long-term ecological cycles



When to manage?
Triggers/thresholds

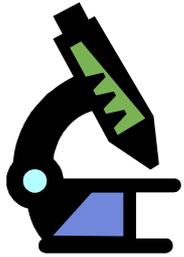


When to monitor?
(Phenology)

Adaptive Management



Research



Evaluate
Models, Tools

New Questions!

Surveillance



Objectives

Decisions



Reduce
uncertainty



**Capacity to
address the
problem!**

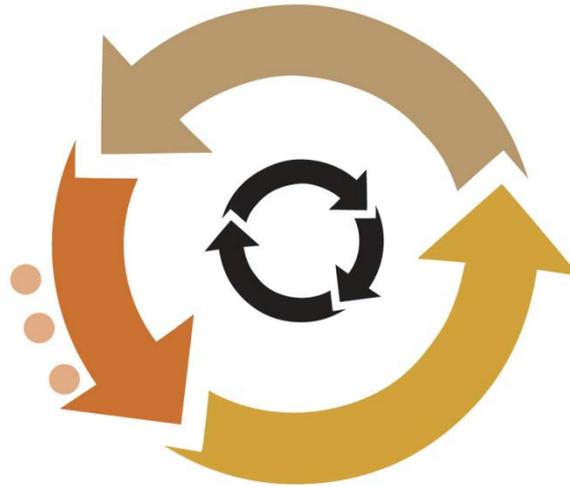
Adaptive Management



Research



INTEGRATE



Surveillance



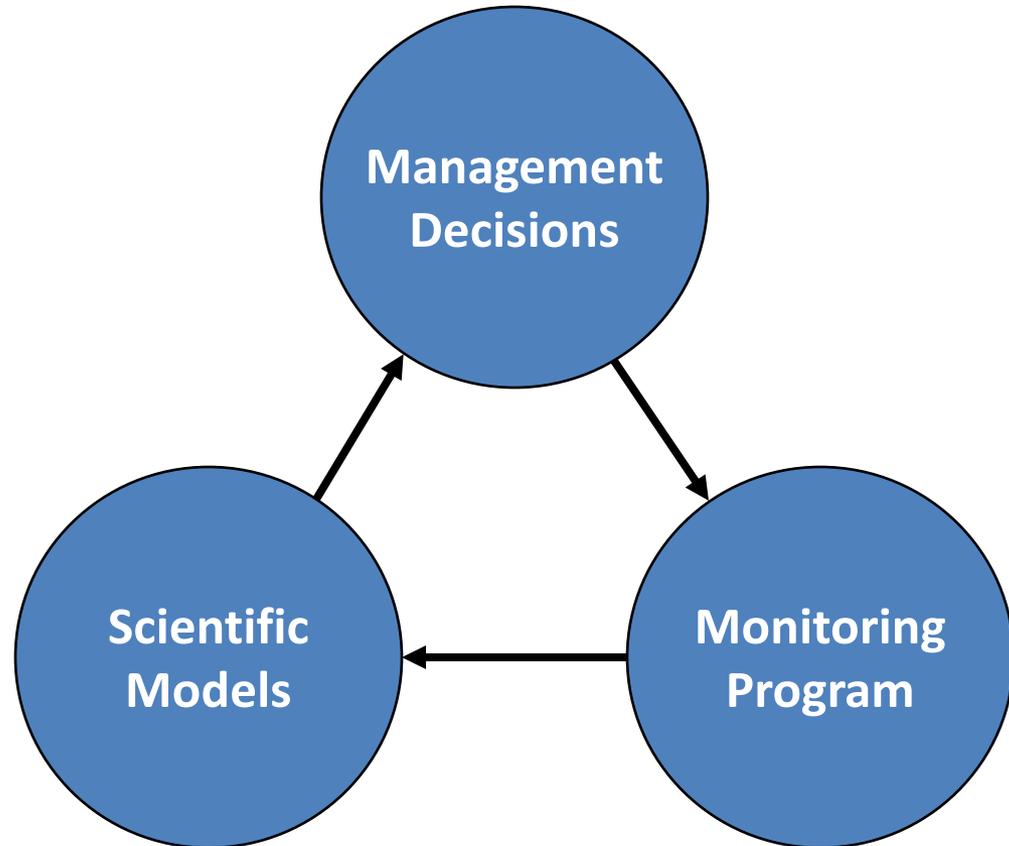
Adaptive Management



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Integrated Monitoring Program

Institutional
challenge:
Integration
across
agencies



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Regional monitoring is an opportunity to
bridge the divide between science & management

The great divide

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Within an Ecoregion

