U.S. EPA's Guidelines for Ecological Risk Assessment

Anne Sergeant

U.S. Environmental Protection Agency
Office of Research and Development

Chair, Joint ANSTF/NISC Prevention Committee's Risk Analysis Working Group

Ecological Risk Assessment

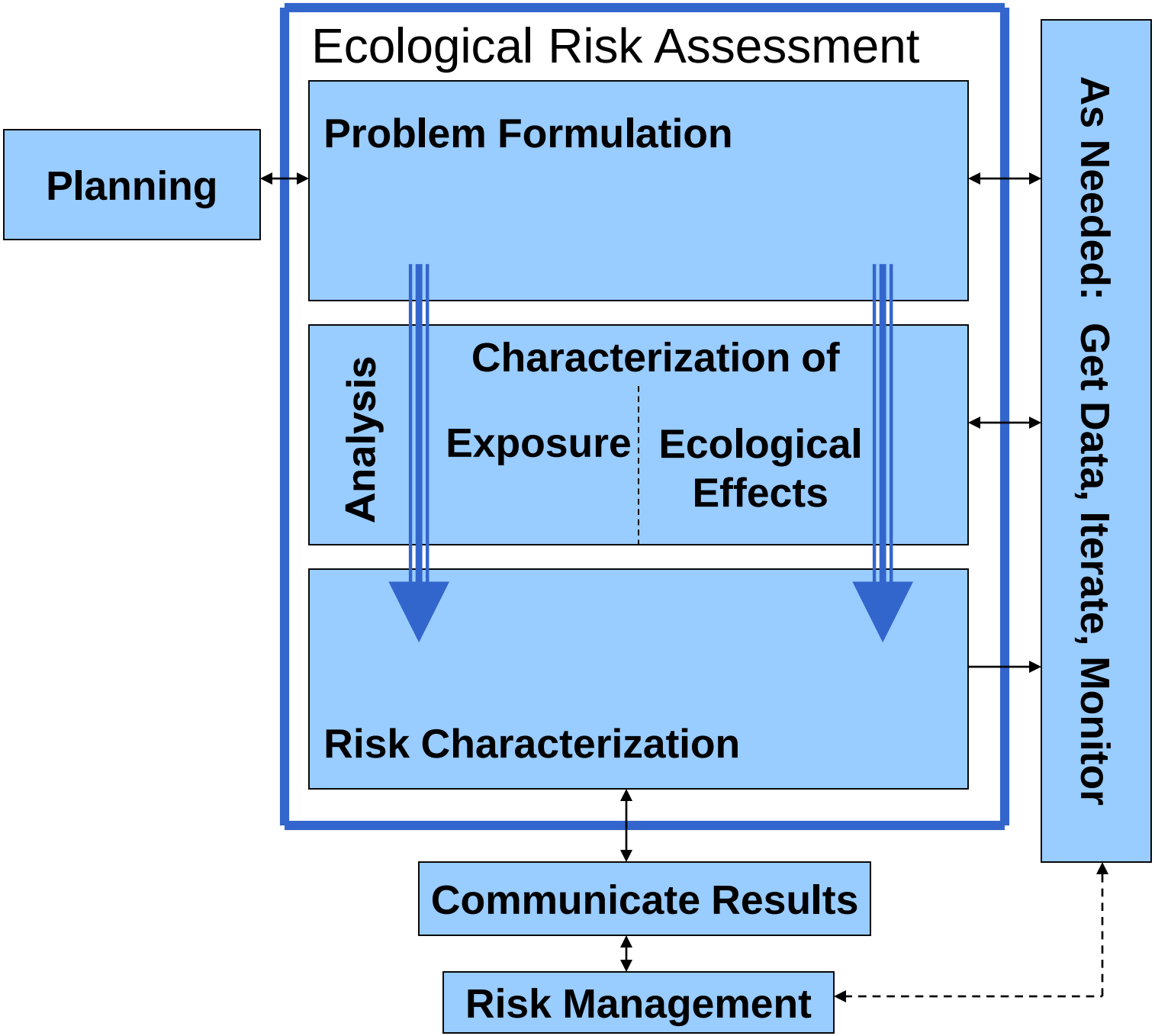
- A process that evaluates the likelihood that adverse ecological effects may occur as a result of exposure to a stressor.

Ecological Risk Assessment

- Well-executed Ecological Risk Assessment is
  - holistic
  - planned
  - focused
  - flexible
  - enlightening

Ecological Risk Assessment

- Ecological Risk Assessment is NOT
  - cost-benefit analysis
  - justification for already-planned activities
  - unfocused data collection


Ecological Risk Assessment
Planning
Problem Formulation
Analysis
Characterization of
Exposure
Ecological Effects
Risk Characterization
As Needed: Get Data, Iterate, Monitor
Communicate Results
Risk Management

Why Would Anybody Ever Want Go Through All This?

- Optimize use of resources
- Determine and agree on what needs to be examined
- Ensure that nothing is overlooked
- Validate “Best Professional Judgement”

Planning

- Gather everybody at the table
  - risk assessor
  - risk manager
  - interested parties
    - »those affected by the decision
- Identify values

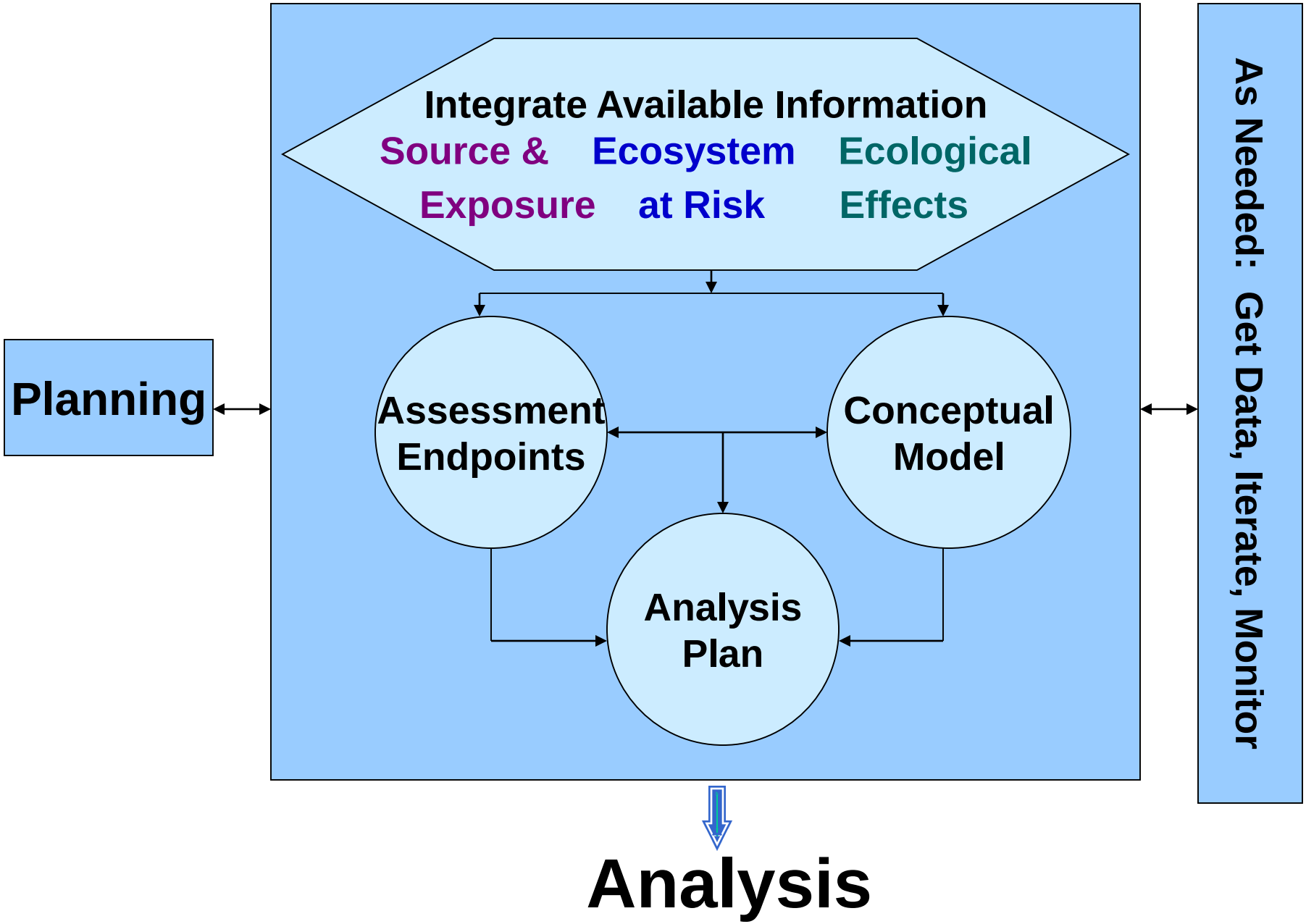
Planning

- Establish management goals
  - Identify
    - Entity
    - Attribute
    - Desired state

Planning

- Example Management Goal
  - Entity: Coho salmon population in the Snake River
  - Attribute: abundance
  - Desired State: population that can support a sport and recreational fishery

Problem Formulation



Assessment Endpoint

- An explicit expression of the environmental value to be protected

Assessment Endpoint

- Identifies
  - Entity
  - Attribute
  - Spatial and temporal extent

Assessment Endpoint

- Based on
  - Ecological relevance
  - Susceptibility to the stressor
  - Relevance to the management goal

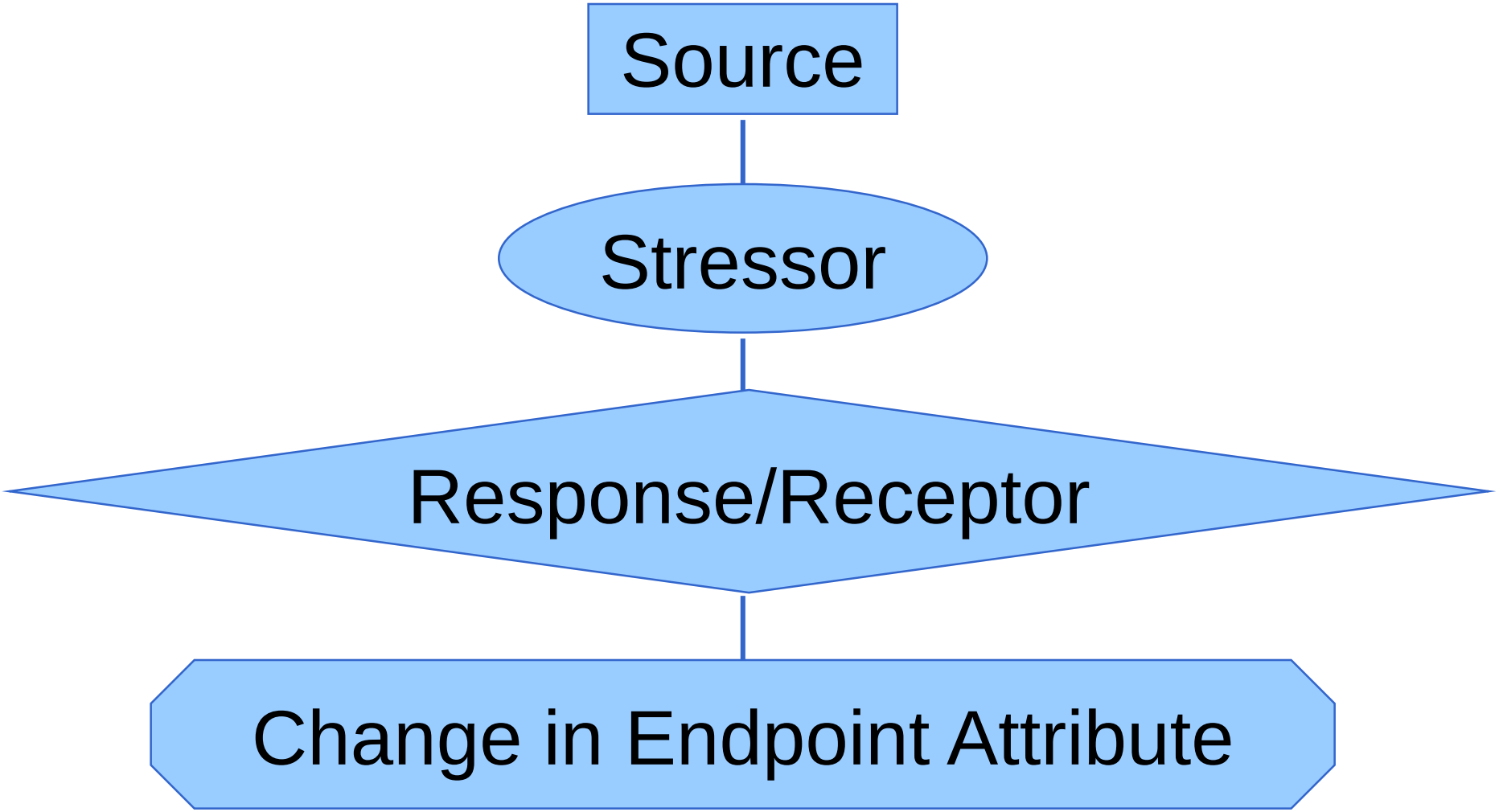
Example Assessment Endpoints

- Bird survival
- Eelgrass habitat and distribution
- Forest community structure and habitat value
- Fish survival, growth, and reproduction

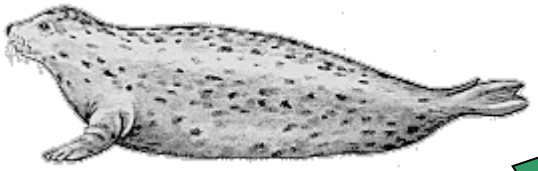
Types of Measures

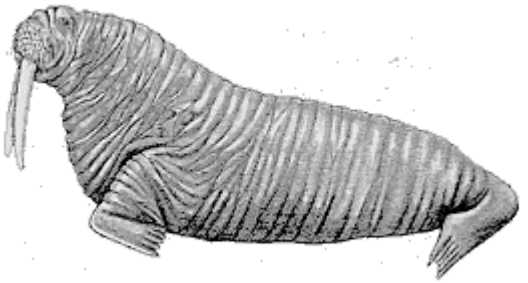
- Exposure
- Effects
- Ecosystem and Receptor Characteristics

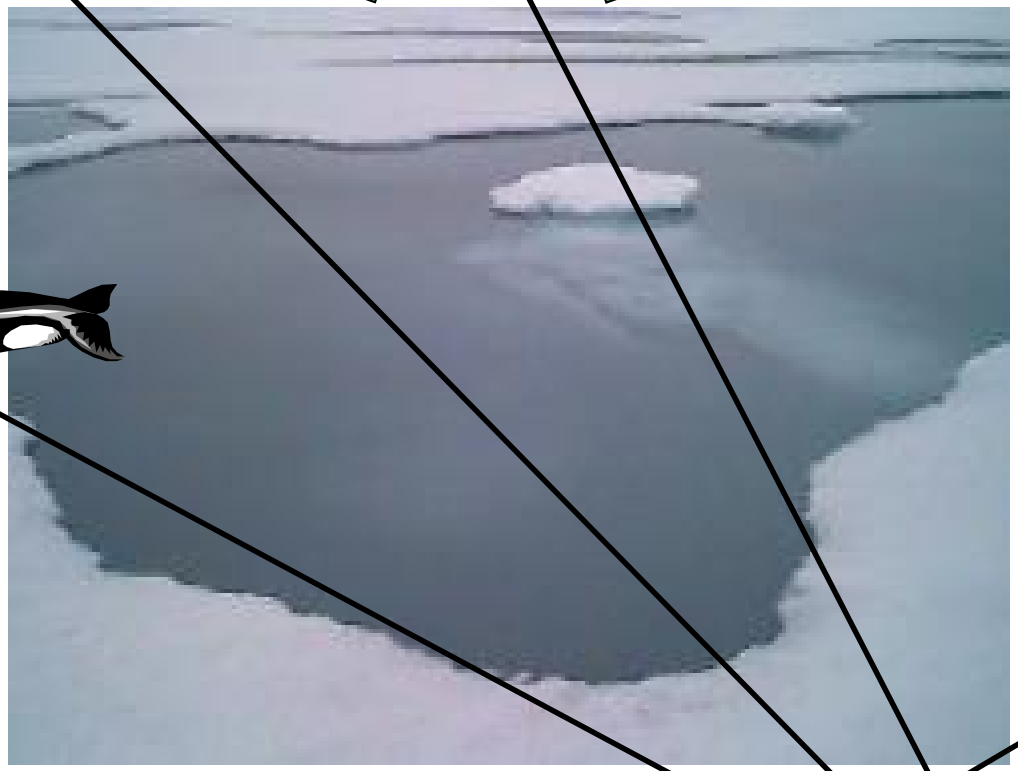
Conceptual Model

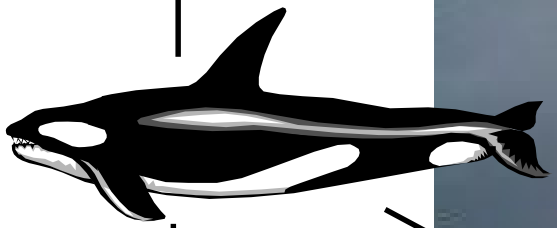


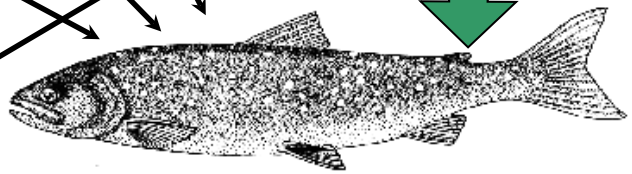
The Yup'ik People

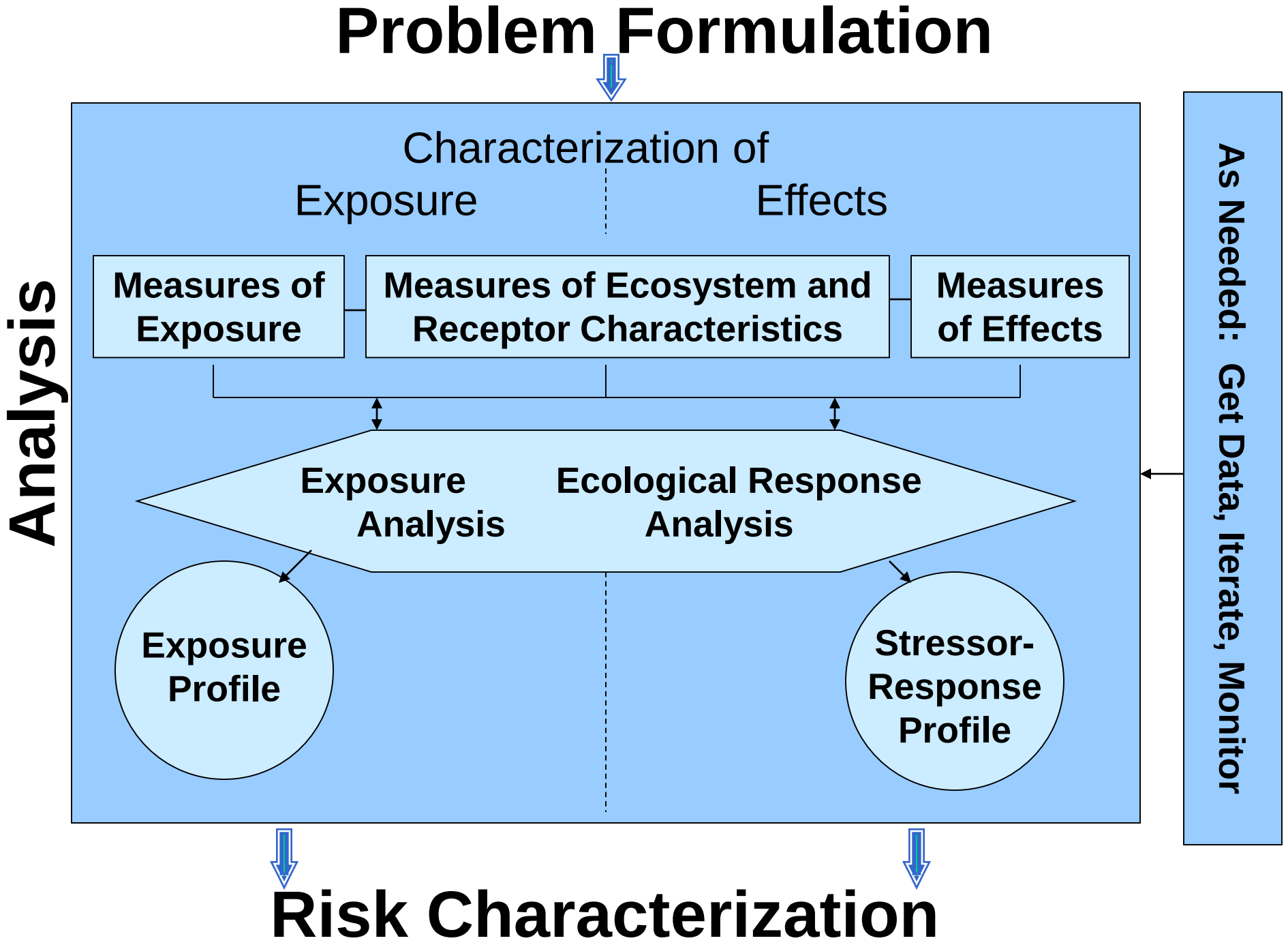











Problem Formulation
Analysis
Characterization of
Exposure
Effects
Measures of Exposure
Measures of Ecosystem and Receptor Characteristics
Measures of Effects
Exposure Analysis
Ecological Response Analysis
Exposure Profile
Stressor-Response Profile
As Needed: Get Data, Iterate, Monitor
Risk Characterization

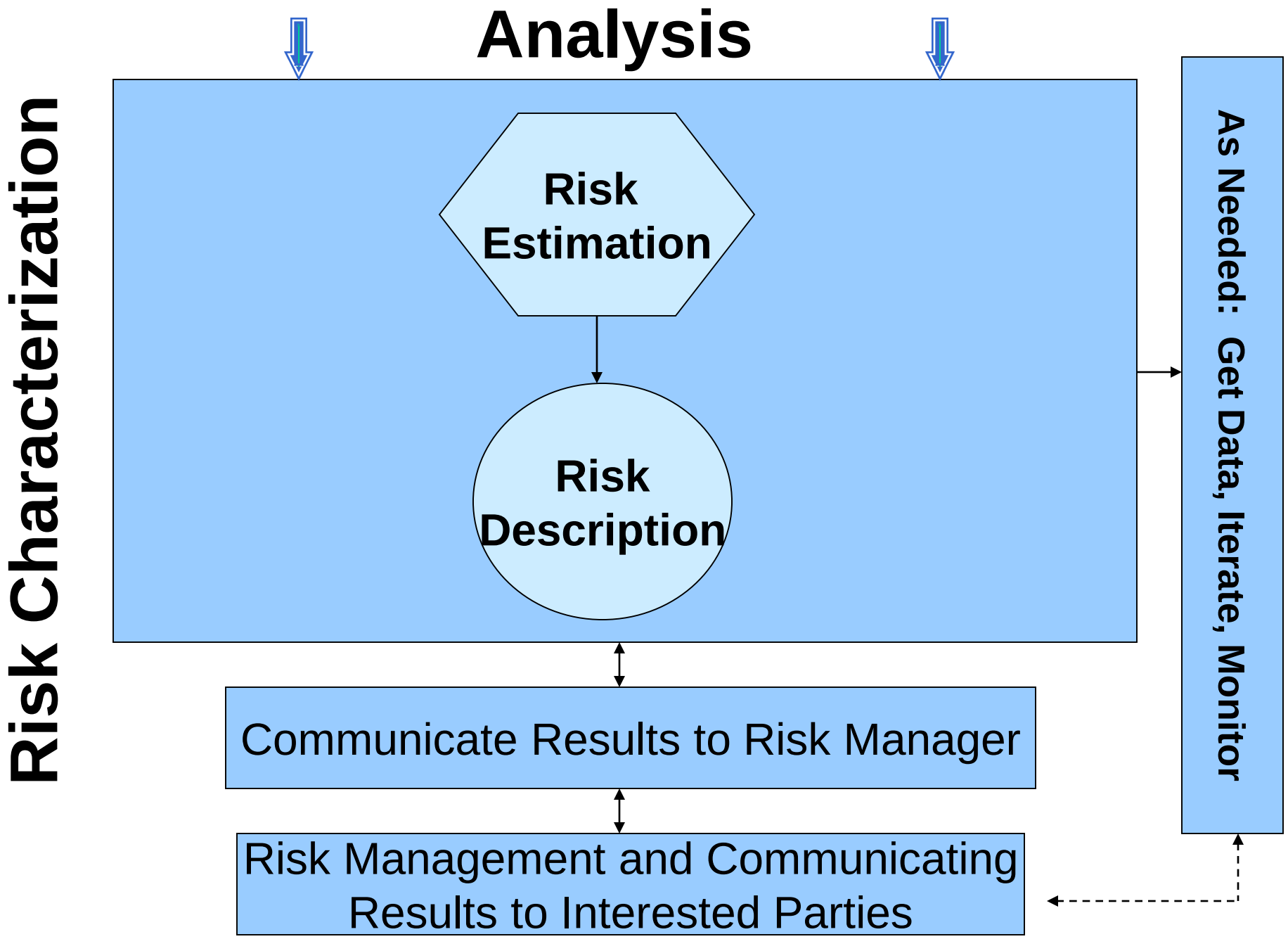
Exposure Analysis

- Describe stressor sources
- Describe stressor distribution
- Describe contact or co-occurrence
- Prepare exposure profile


Killdeer

Ecological Response Analysis

- Stressor-response analysis
- Establish causality
- Link measures to assessment endpoints
- Prepare stressor-response profile


Analysis
Risk Characterization
Risk Estimation
Risk Description
As Needed: Get Data, Iterate, Monitor
Communicate Results to Risk Manager
Risk Management and Communicating Results to Interested Parties

Risk Characterization

- Integrates stressor-response and exposure assessments
- Uses qualitative as well as quantitative information
- Describes uncertainty

Risk Estimation

- Compares exposure and effects data
  - Field surveys
  - Categorical rankings
  - Process models

Risk Description

- Expected effects
- Adversity
  - nature and intensity of effects
  - temporal and spatial scale
  - recovery potential

Risk Description

- Lines of Evidence
  - relevance to assessment endpoints
  - relevance to conceptual model
  - data quality and sufficiency
  - causality
  - magnitude/direction of uncertainty

Reporting Risks

- Clear
- Transparent
- Reasonable
- Consistent

Uncertainty

- Knowable
  - Reducible
  - Irreducible
- Unknowable
- Affects our **confidence** in the assessment

Communicating Results to the Risk Manager

- Management objectives
- Conceptual model
- Assessment endpoints
- Accessible terminology and style

Informing Risk Management

- Relate ecological data to risk-management decisions

We Can Use the EPA Process to:

- Frame the risk-assessment question
- Identify resource needs
- Minimize the chance of surprises
- Document data and assumptions

Finding the Guidelines

http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460