# Modeling and Adaptive Management

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Adaptive Management
Strategies

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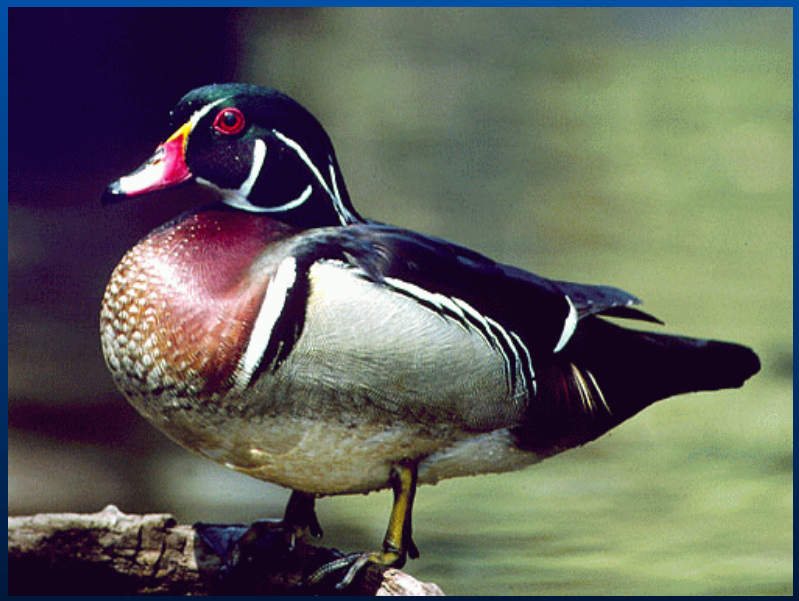


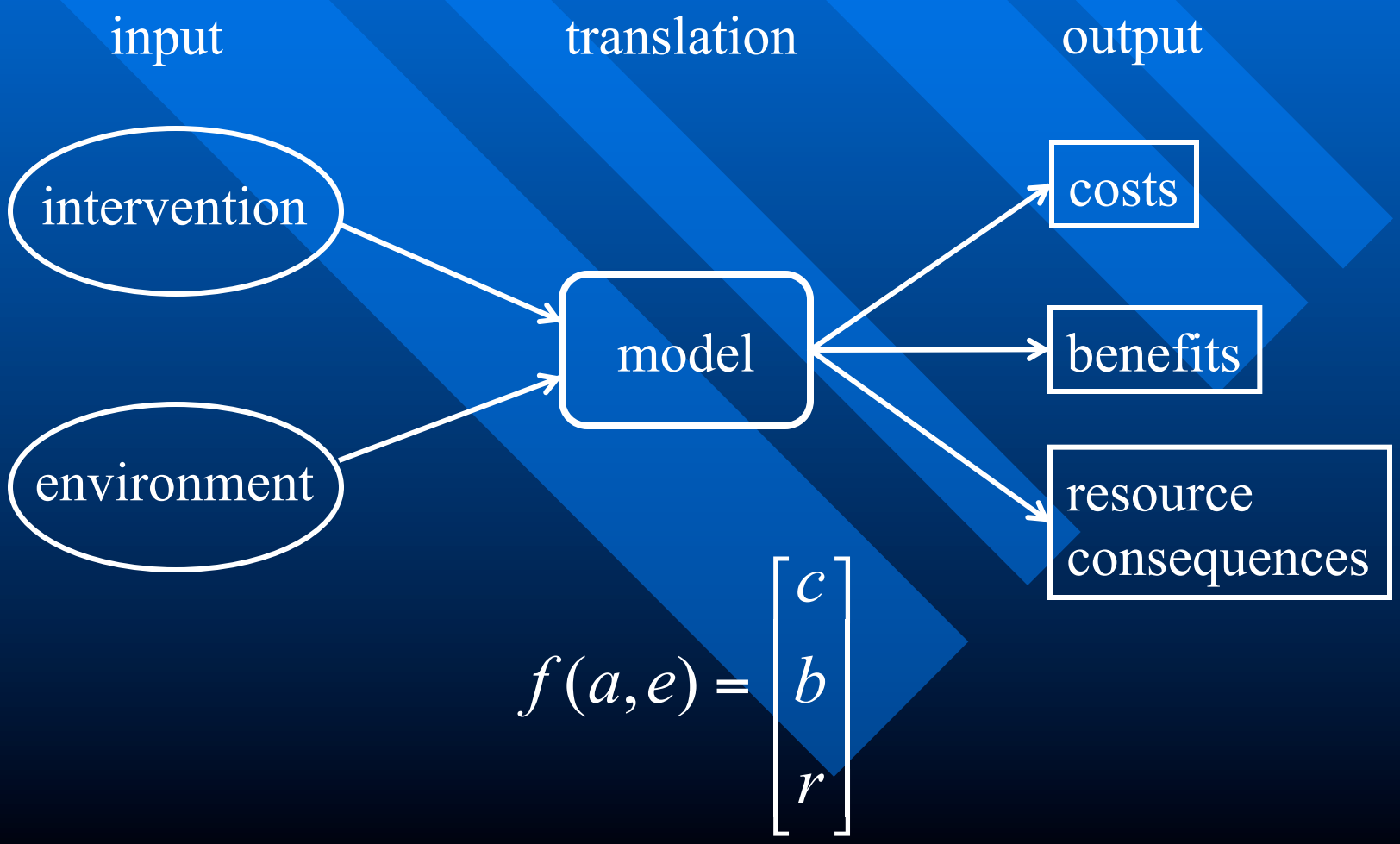
# 5 Key Points about Models

- Every scientific investigation has an underlying model
- Every management strategy has an underlying model
- Models can take many forms
- There is no “right” model
- You use models every day

# Hypotheses and Models

- Resource hypothesis: an assumed or proposed explanation of resource patterns
- Resource model: a representation of the resource system
- Hypotheses are incorporated into models

# Models in AM: Link Management Actions to Management Impacts



# Models and Learning in AM

- Models in AM incorporate different hypotheses about how the resource system works
- Different models produce predicted outcomes from management
- Post-decision monitoring produces an observed outcome
- Comparison of predicted against observed outcomes lets you learn about which hypotheses are most appropriate for the resource system being managed

# Uses of Modeling in AM

- Makes explicit one's assumptions about the resource system
- Generates predictions of management impacts based on those assumptions
- Allows assumptions to be tested by comparing predicted outcomes against monitoring data

# Models can Express Uncertainty

- We often are unsure about what the effect of an action will be
- Uncertainty (or disagreement) is expressed through different hypotheses about how an ecosystem works
- Alternative models can imbed these hypotheses to capture the uncertainty
- The central focus of AM is to reduce this uncertainty, through the comparison of model predictions against monitoring data

# Alternative Models

- To be useful in an adaptive management context, alternative models should:
  - Differ in their predictions, so as to determine which action is most appropriate
  - Be testable with monitoring data, so as to determine which model is most appropriate

# Features of Models in AM

- Models characterize resource changes through time
- Management actions are included as drivers that influence resource dynamics
- Environmental conditions are included as needed to describe resource dynamics

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# Comments

- Common complaint: "there's not enough data to build a model"
  - But that's exactly when AM is most useful
  - It is possible to build models based on ecological understanding, absent new data
- What's the alternative to building and using explicit models?
  - Letting the models implicit in management actions remain unexpressed and untested

# Starting the Modeling Process

- Identify the ecosystem processes that link management actions to desired outcomes (objectives)
- Identify sources of uncertainty that impede management, and express that uncertainty with simplified models
- Develop the quantitative details as the need requires and data allow
- It is helpful to work with an individual who is adept at guiding model development