

# The FWS R3/R5 Impoundment Study: A project of the Refuge Cooperative Research Program

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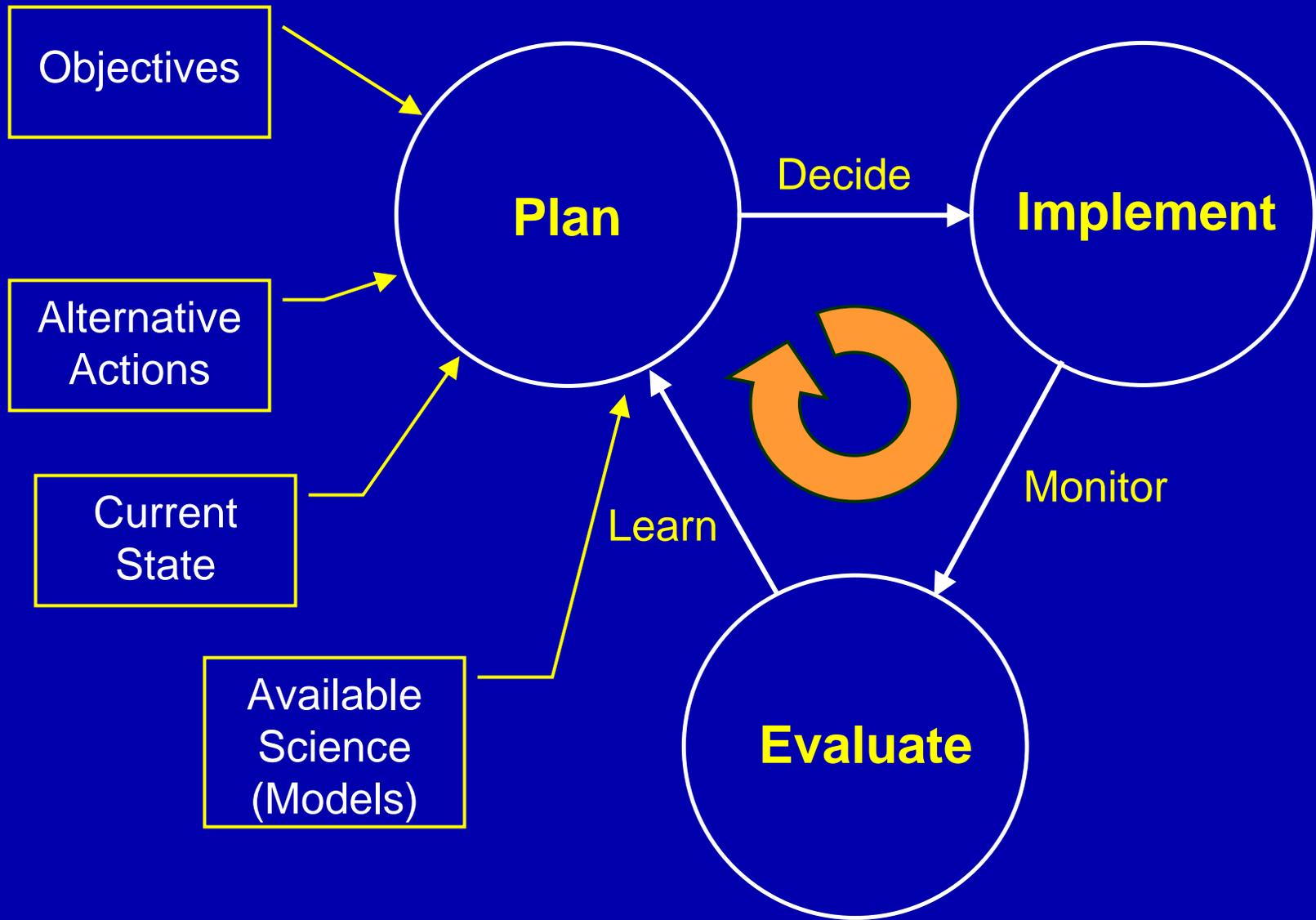
<sup>3</sup> *USFWS National Wildlife Refuge System*

# Overview

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- Monitoring in the context of adaptive resource management
- Monitoring for wetland and waterbird management
  - Describe large-scale management experiment designed to improve wetland management on National Wildlife Refuges

# Structured Decision Making



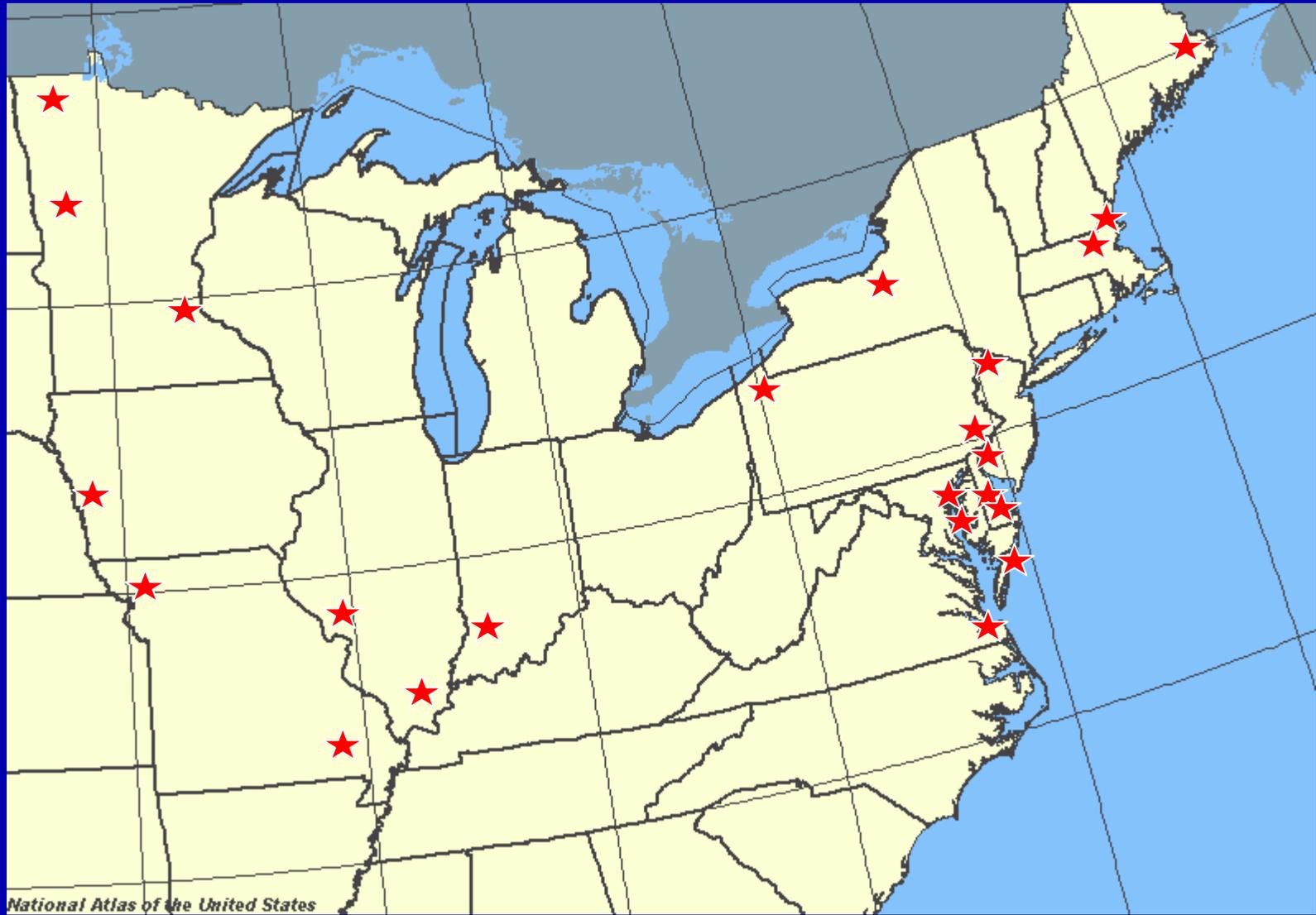
# Three Reasons to Monitor

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In a decision-making context:

1. State-dependent decision. To assess the current state of the system, in order to determine which action to take.
2. Evaluation. To evaluate if management objectives are being met.
3. Learning. To increase understanding of system behavior and the effects of management actions.

# USGS/FWS R3/R5 Impoundment Study



# Impoundment Management Objectives

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- Means objectives
  - Provide appropriate water levels, invertebrate communities, vegetation structure and composition to attract and support waterbirds
- Ends objectives
  - Attract and support waterbirds during important phases of the annual cycle
  - Establish and maintain native plant communities

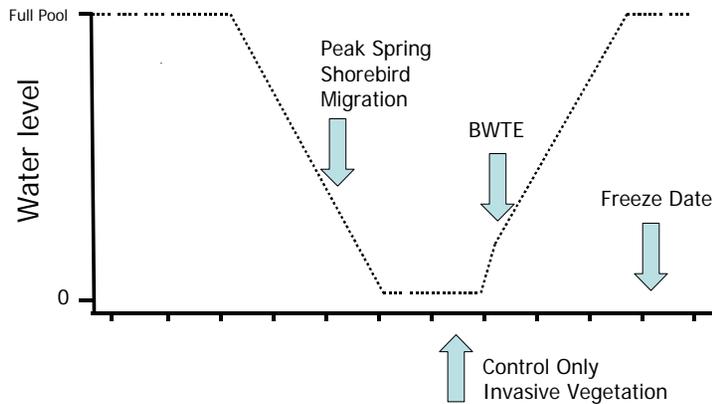
# Alternative Management Actions: Spring vs. Fall Drawdown



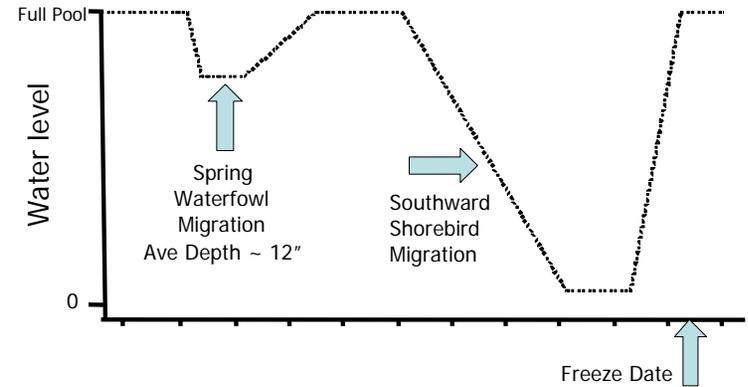
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# Management Treatments

## Treatment A: Spring Drawdown



## Treatment B: Summer/Fall Drawdown



# Experimental Design

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	Yr 1	Yr 2	Yr 3
Impoundment 1	A	B	B
Impoundment 2	B	A	A

# Monitoring Design

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Driven by the decision structure:

- Bathymetry and water levels
- Invertebrates
- Vegetation
- Waterbirds

*Monitoring for:*

# State-dependent Decisions

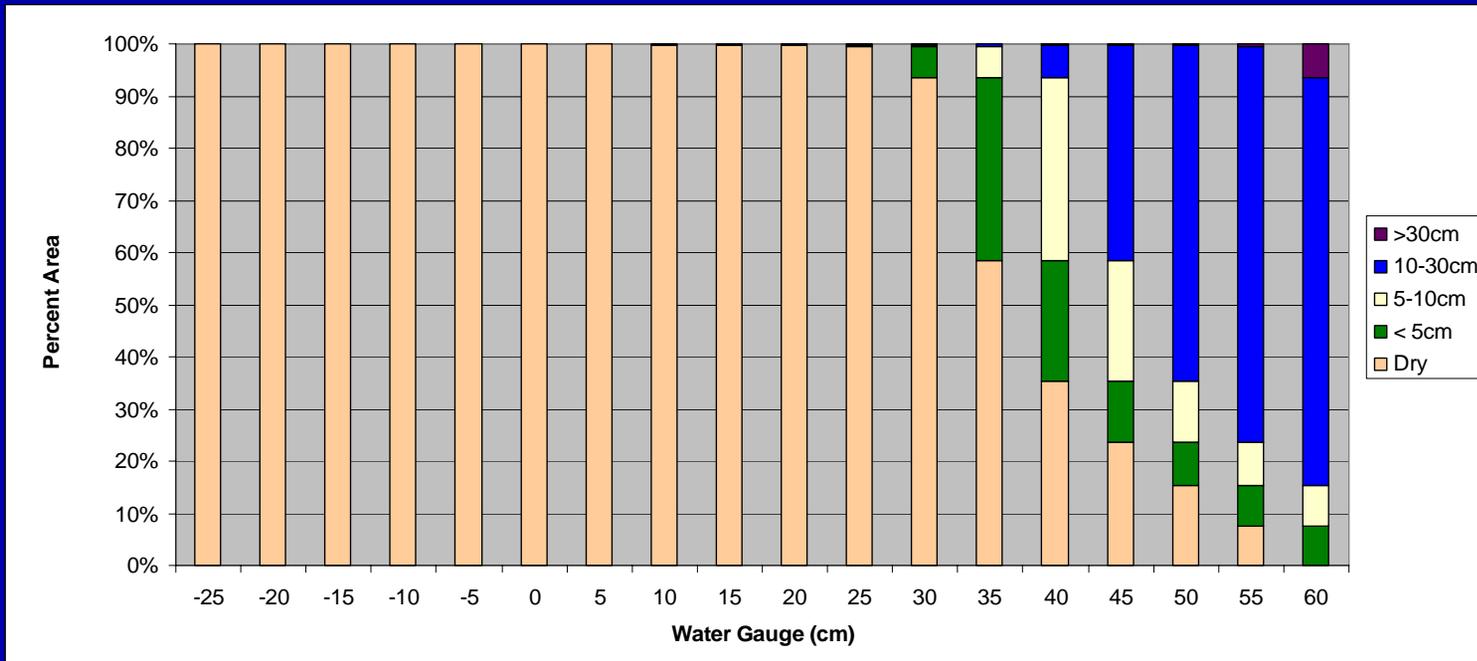
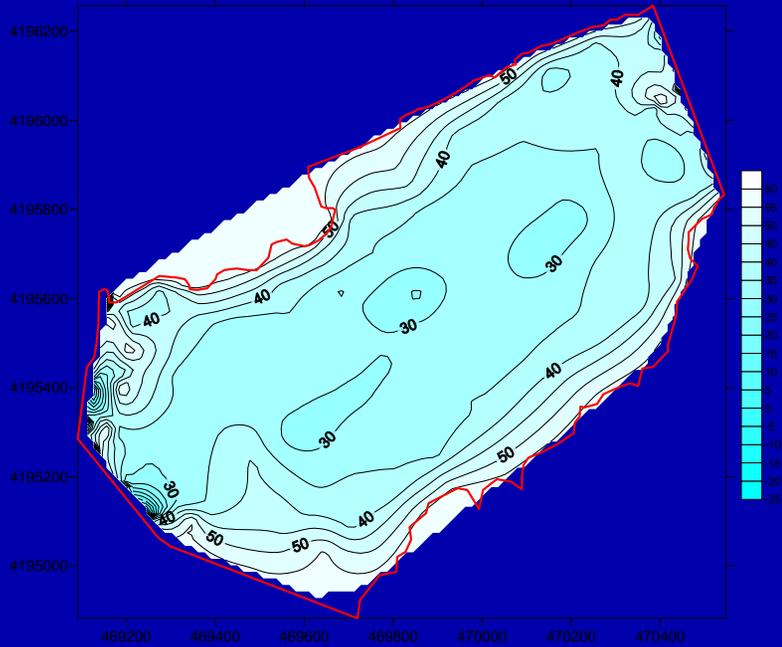
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- Annual decision (spring/fall/none)
  - Vegetation cover
  - Presence and extent of invasive plants
- Weekly decisions (timing & rate)
  - Water level
  - Timing of bird arrival

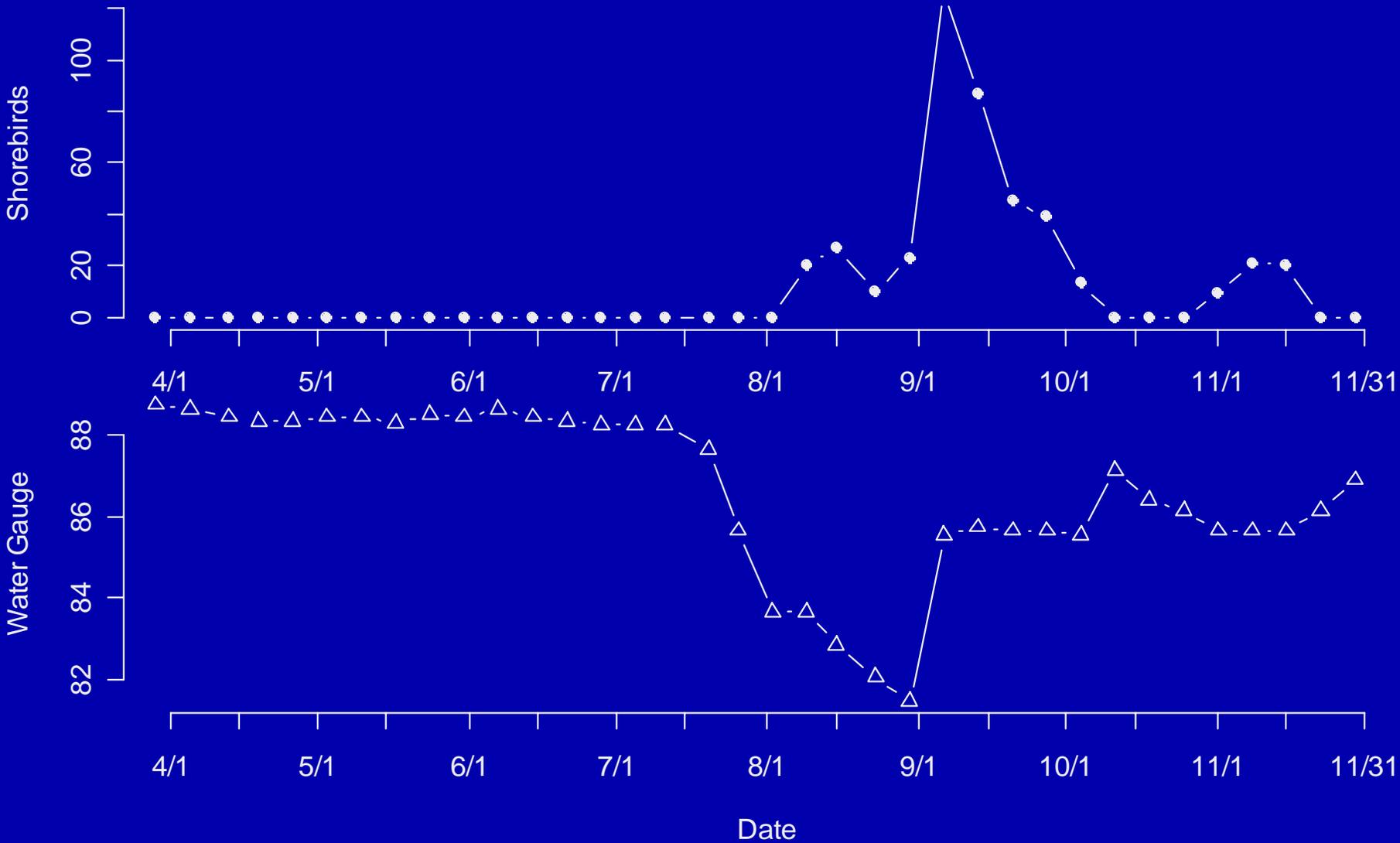
*Monitoring for:*  
**Evaluation**

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- Mudflat and Shallow Water Habitats
  - Bathymetry models and water gauges
- Waterbird Abundance
  - Weekly bird surveys



# Patuxent NRR, Knowles 1, 2005 (B Treatment)

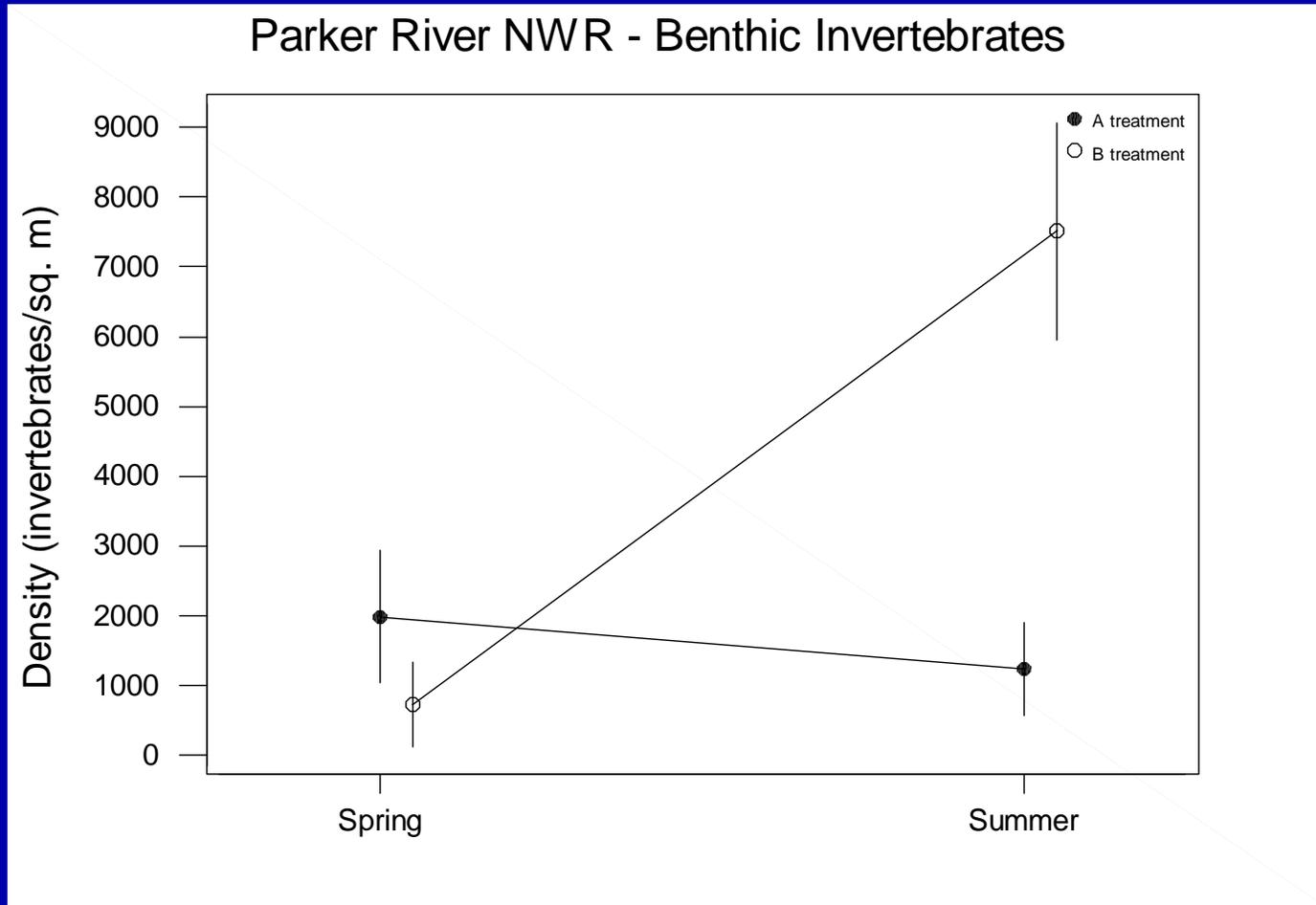


*Monitoring for:*  
**Learning**

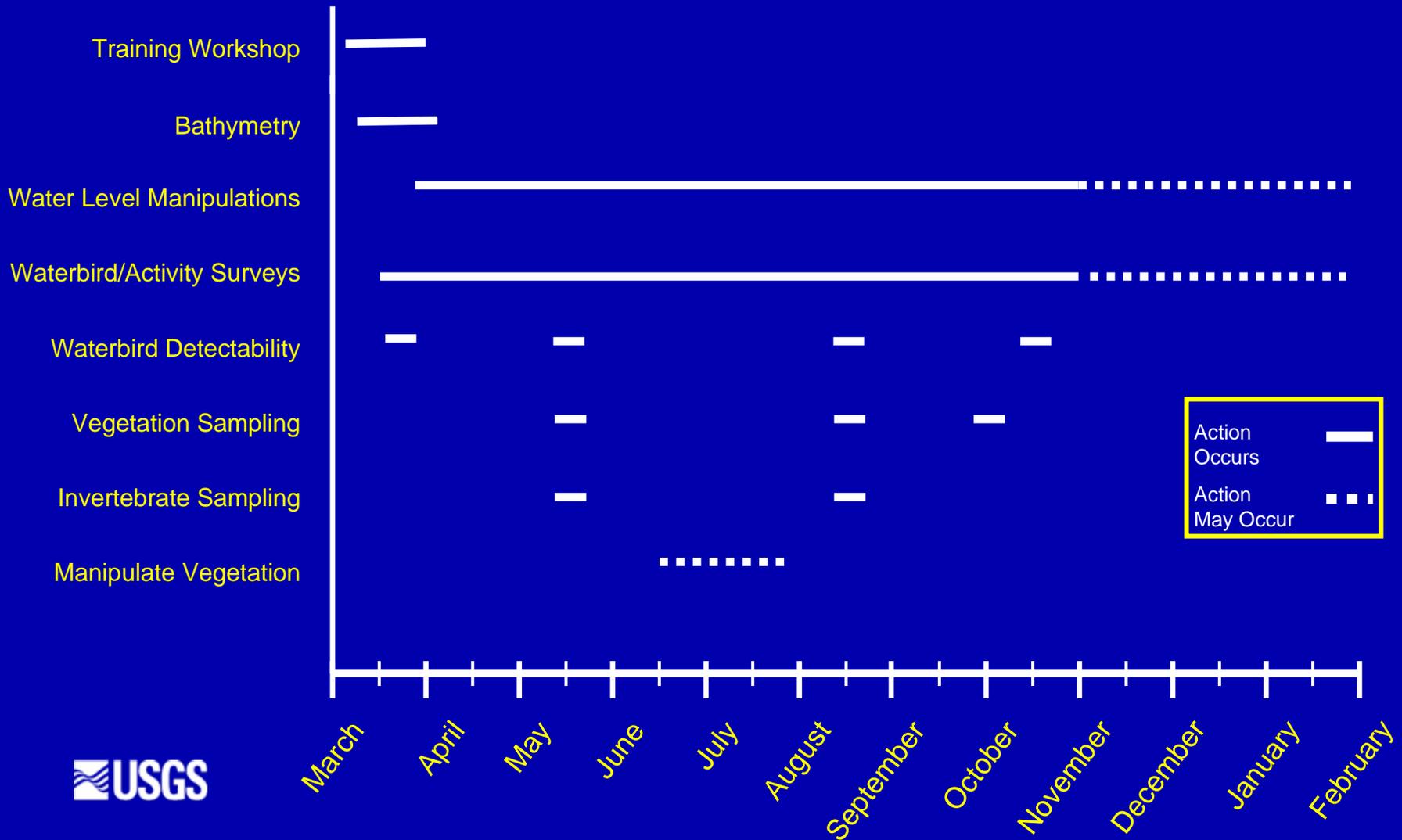
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- Invertebrate Response
  - Mudflat samples during migration
- Vegetation Response
  - Cover and height monitored three times per year

# Invertebrate Monitoring



# Timing of Actions & Monitoring



# Summary

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- Three reasons to monitor in the context of ARM
  - State-dependent Decisions
  - Evaluation
  - Learning
- Monitoring design is derived from the decision context

# RCRP Partnership

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## ■ FWS Contributes

- Study objectives
- Study sites
- Coordination
- Data collection
- Data management
- Management actions

## ■ USGS Contributes

- Study design
- Training
- Data management
- Data analysis
- Report writing

# Acknowledgments

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- USGS Refuge Cooperative Research Program
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- USFWS Refuge Biologists and Project Leaders from Regions 3 and 5
- Marilyn Eames, USFWS, Laurel, MD