Towards a Gulf-wide Bird Monitoring Network; Identifying Objectives to Prioritize Actions

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Monitoring Issue:

✓ Lack coordinated, objective-driven framework to guide monitoring efforts at large spatial scales across the Gulf of Mexico


• “Achieving mandated recovery goals depends on understanding both population trends and the demographic processes that drive those trends.”

• “The United States needs strategic national research plans for key marine species and ecosystems based on evaluation of cause and effect and on integrated monitoring of abundance and demographic traits.”
Monitoring Issue:

✓ Lack baseline data for many bird species
✓ Lack ability to assess effect of system drivers and management on birds at large (spatial & temporal) scales
Fundamental Issue:

☑ Lack clearly defined and agreed upon goals and values for an avian monitoring program.
Question: How do we identify the goals and values and key data needs per bird monitoring given the interactions and complexities of the Northern Gulf of Mexico Ecosystem?

What do we value?

- What bird(s)?
- What habitat(s)?
- What season (B, W, M)?
- What management strategy?
- What habitat(s)?
- What season (B, W, M)?
- What ecological process?
- What habitat(s)?
- What season (B, W, M)?
Structured Decision Making Process

PrOACT

- Problem framing
- Objectives
- Actions
- Consequences
- Trade-offs

Frame the Role of Monitoring within Gulf of Mexico

Vision: Integrated Restoration and Management of the Gulf of Mexico Ecosystem

- Conservation Planning
  - Beach Re-nourishment
  - Marsh Restoration

- Implementation
  - Fisheries Management
  - Barrier Island Creation / Restoration

- Restoration & Management

System Drivers
- Sea-level Rise & Subsidence
- Freshwater Management
- Coastal Development

Monitoring

Goal: Maximize Usefulness of Bird Monitoring Data to Inform and Advance Bird Conservation

Bird Monitoring Program

Adaptive Feedback Loop

[Process Objectives]
- Objectives
- Survey Design
- SOPs
- Data Management
- Data Analysis
- Reporting
Vision: An integrated, coordinated and sustained monitoring and analysis system that advances bird conservation in the Northern Gulf of Mexico.
Problem Framing

Problem Statement:

How do we develop a cost-effective bird monitoring strategy for the Gulf of Mexico that evaluates ongoing, chronic, and acute threats and conservation activities, maximizes learning, and is flexible and holistic enough to detect novel ecological threats with respect to management triggers and to evaluate new and emerging conservation activities?

Decision Maker = SDM Group + suite of additional partners

Decision = What suite of monitoring projects to include in the Gulf of Mexico Bird Monitoring Strategy to inform and facilitate bird conservation?
Development of Bird Monitoring Objectives

**Context**

- What is your objective?
- What do you value?
- Do the objectives represent your values?

**Content**

- Do the objectives represent your values?

**Vision:** Integrated Restoration and Management of the Gulf of Mexico Ecosystem

**System Drivers**
- Shore-level Rise & Subsidence
- Freshwater Management
- Coastal Development

**Objectives**
- Conservation Planning
- Implementation
- Restoration & Management
- Beach Re-nourishment
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**Monitoring**

**Goal:** Maximize Usefulness of Bird Monitoring Data to Inform and Advance Bird Conservation

**Bird Monitoring Program**

**[Process Objectives]**
- Objectives
- Survey Design
- SOPs
- Data Management
- Data Management
- Reporting
Development of Bird Monitoring Objectives

Context

Assess Core Values:

- Rigor
- Relevancy
- Integration
- Partnership
- Baseline
- Management
- Sustainability
- Cause & Effect
Bird Monitoring Objectives for the Gulf of Mexico

- **Fundamental Objective:** Maximize Integration of Monitoring Projects
- **Fundamental Objective:** Maximize Rigor of Monitoring Projects
- **Fundamental Objective:** Maximize Relevance of Monitoring Projects

  ✓ **Objective:** Maximize Understanding of Population and Habitat Status Assessments (i.e., baseline information)

  ✓ **Objective:** Maximize Understanding of Management Actions and their Respective Impacts on Avian Populations and their Habitat

  ✓ **Objective:** Maximize Understanding of Ecological Processes and their Respective Impacts on Avian Populations and their Habitat
Goal: Maximize Usefulness of Bird Monitoring Data to Inform Bird Conservation in the Northern Gulf of Mexico

Objectives Hierarchy and Weights for Bird Monitoring

Integration (ω=0.25)  →  Status Assessment (ω=0.34)  →  Breeding (ω=0.36)

Relevancy (ω=0.40)  →  Ecological Processes (ω=0.29)  →  Habitat (ω=0.45)  →  Wintering (ω=0.33)

Rigor (ω=0.35)  →  Management (ω=0.37)  →  Species (ω=0.55)

Assignment of objective weights is a means of setting priorities

Note: Weights depicted here are preliminary and not final.
# Development of Performance Measures for each of the Objectives

Identification of attributes to measure performance of each objective (i.e., what do you value about the objective?)

<table>
<thead>
<tr>
<th>Number of Species</th>
<th>Temporal Scope</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Design</td>
<td>Spatial Scope</td>
<td>Ecological Processes</td>
</tr>
<tr>
<td>Data Management</td>
<td></td>
<td>System Drivers</td>
</tr>
<tr>
<td>Number of Partners</td>
<td>% Uncertainty</td>
<td>Power Analysis</td>
</tr>
<tr>
<td>Adaptive Management</td>
<td></td>
<td>Management Actions</td>
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<tr>
<td>Address Existing Priority</td>
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<td>Broader Impacts</td>
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<td>Leverage Resources</td>
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</tbody>
</table>
Maximize Usefulness of Bird Monitoring Data for Conservation

- Relevance of Monitoring Data
  - Status Assessment
  - Ecological Process
- Integration of Monitoring Data
- Rigor of Monitoring Data
  - Management Effectiveness
Maximize Usefulness of Bird Monitoring Data for Conservation

- Relevance of Monitoring Data
- Integration of Monitoring Data
- Rigor of Monitoring Data

Status Assessment

Populations
- 1. Priority Species
- 2. Spatial Scope
- 3. Temporal Scope
Maximize Usefulness of Bird Monitoring Data for Conservation

- Relevance of Monitoring Data
- Integration of Monitoring Data
- Rigor of Monitoring Data

Status Assessment
- Populations
  - 1. Priority Species
  - 2. Spatial Scope
  - 3. Temporal Scope
- Habitats
  - 4. Quantity Assessment
  - 5. Quality Assessment
  - 6. Temporal Scope
Maximize Usefulness of Bird Monitoring Data for Conservation

Relevance of Monitoring Data
- Status Assessment
  - Populations
    - 1. Priority Species
    - 2. Spatial Scope
    - 3. Temporal Scope
  - Habitats
    - 4. Quantity Assessment
    - 5. Quality Assessment
    - 6. Temporal Scope

Integration of Monitoring Data

Rigor of Monitoring Data

Management Effectiveness
- 7. Taxonomic Scope
- 8. Spatial Scope
- 9. Knowledge Gaps
- 11. Adaptive Management

Knowledge Gaps
Maximize Usefulness of Bird Monitoring Data for Conservation

Relevance of Monitoring Data
  - Status Assessment
    - Populations
      - 1. Priority Species
      - 2. Spatial Scope
      - 3. Temporal Scope
    - 34. # Processes
  - Ecological Process
    - Habitats
      - 4. Quantity Assessment
      - 5. Quality Assessment
      - 6. Temporal Scope
    - 35. Uncertainty
  - Management Effectiveness
    - 36. Adaptive Mgmt
      - 7. Taxonomic Scope
      - 8. Spatial Scope
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Integration of Monitoring Data
  - Rigor of Monitoring Data

Rigor of Monitoring Data
  - 1. Priority Species
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Knowledge Gaps
  - Current Practices
  - Adaptive Management
Maximize Usefulness of Bird Monitoring Data for Conservation

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- Ecological Process
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    - 4. Quantity Assessment
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    - 6. Temporal Scope
- Management Effectiveness

Integration of Monitoring Data
- 12. Data Share
- 13. Impacts
- 14. Priorities
- 15. Partners
- 16. Match
- 17. Classification Systems

Rigor of Monitoring Data
- 18. Protocols
- 19. Data Store
- 20. References
- 21. Code
- 22. Maps

Objective/Hypotheses
- 23. Objective/Hypotheses

Design
- 24. Design

Target taxa
- 25. Target taxa

Responses
- 26. Responses

Statistics
- 27. Statistics

Data Management
- 28. Power
- 29. Data Management

Inference
- 30. Inference

Budget
- 31. Budget

Timeline
- 32. Timeline

Methods
- 33. Methods
Maximize Usefulness of Bird Monitoring Data for Conservation

Status Assessment
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  - 1. Priority Species
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  - 3. Temporal Scope
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Ecological Process

Management Effectiveness
- 12. Data Share
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Relevance of Monitoring Data

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- 23. Objective/Hypotheses
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- 25. Target taxa
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- 33. Methods

7. Taxonomic Scope
8. Spatial Scope
9. Knowledge Gaps
11. Adaptive Management
Development of Value Models for each Objective

Example: Objective = Status Assessment – Populations (Breeding)

- Maximize number of priority species surveyed ($\omega = 0.38$)
- Maximize survey duration (longevity of data collection) ($\omega = 0.32$)
- Maximize the spatial scope of surveys ($\omega = 0.30$)

Rules for Sub-Objective

- 0 = No priority species
- 1 = 1 priority species
- 2 = 2 priority species
- 63 = 63 priority species

Rules for Performance Metric

- 1 = 1 to 4 years
- 2 = 5 to 10 years
- 3 = 11 to 15 years
- 4 = 16 to 20 years
- 5 = 20+ years

Rules for Taxonomic Scope (Number of priority species)

- 0 = No part of the priority species range
- 1 = <25% of the priority species range
- 2 = 25 to 49% of the priority species range
- 3 = 50 to 75% of the priority species range
- 4 = >75% of the priority species range

Graphs showing Value Function with Taxonomic Scope, Duration of monitoring program, and Percent of priority species range being monitored during a specific time period.
Development of Value Models and Performance Metrics

OBJECTIVES:

- Status Assessment
- Ecological Processes
- Management
- Rigor
- Integration

Value models and performance metrics have been developed for all objectives and are currently under review by the working group.
Decision Support Tool:

Use of Value Models to Conduct Trade-off Analysis – *which survey or group of surveys yield the greatest contribution to the stated values – constrained by some factor (e.g., cost)?*

Hypothetical Example: Analysis of 10 Potential Surveys

Blue represents survey selection based on value models
Red represents random selection of surveys
Decision Support Tool:

Use of Value Models to Conduct Trade-off Analysis – *which survey or group of surveys yield the greatest contribution to the stated values – constrained by some factor (e.g., cost)?*

Can also constrain by Objectives, Taxa, Habitats, etc
Pathway for Moving the Conceptual Model to Reality

SDM Value Models:

Frames Bird Monitoring Issues and Provides Context;
Provides Insight per Values, Needs, and Priorities;
Provides Basis for Development of Decision Support Tool

Develop Monitoring Framework

Written Report that Documents Underlying Decisions, Assumptions, Objectives, Values, and Priorities for Bird Monitoring

Long-term

Basis for Establishment of GoM Bird Monitoring Program

Short-term

Inform and Influence (Coordination across Agencies)

Develop and Implement New Bird Monitoring Surveys
Vison: A coordinated and sustained monitoring and analysis system that advances bird conservation in support of integrated restoration and management of the Gulf of Mexico ecosystem.

The SDM Process yields:

✓ Structure and insight into key components (aka. Process Objectives) of a region-wide avian monitoring program;

✓ Structure and transparency to objectives, values, and priorities underpinning a region-wide avian monitoring program;

✓ Decision support tool to facilitate trade-off analysis (e.g., cost:benefit of individual and/or a portfolio of surveys)

✓ Structure to coordinate and cross-walk with other biotic and abiotic monitoring efforts within the Gulf of Mexico.
Opportunities in Coordinated Bird Monitoring

- Increasing effectiveness of restoration expenditures

- Identifying areas for organizations to pool/leverage resources

- Raising new money to implement key surveys
  -- Foundations, non-traditional sectors, etc.

- Guiding infrastructure development
  -- Highways, energy development, etc.

- Bringing a landscape perspective to local adaptation
  -- How do I fit in? How important is this regionally?
Moving Towards a Region-wide Avian Monitoring Framework for the Northern Gulf of Mexico

Vision: Integrated Restoration and Management of the Gulf of Mexico Ecosystem

Conservation Planning → Implementation → Restoration & Management

System Drivers:
- Sea-level Rise & Subsidence
- Freshwater Management
- Coastal Development

Monitoring

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Adaptive Feedback Loop

Bird Monitoring Program

Objectives, Survey Design, SOPs, Data Management, Data Analysis, Reporting
Thanks for your time and attention!

Questions?