Human Disturbance Impacts on Marsh Bird Biodiversity

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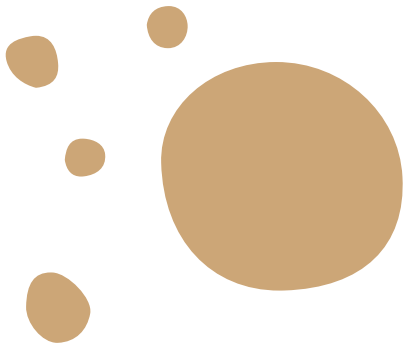


Introduction

Why birds?

- Important indicators of ecosystem health[1]
- Typically high trophic levels; varied diet reflects entire food web[1]
- Offer insights into ecosystem status and change over time[1]

Human Impact

- Rapid industrialization and population growth → more human impact[2]
- Local (Bay Area) impact is increased[3]
- International marsh bird populations have been declining
    - Eg. 9% annual decline in Saltmarsh Sparrow populations[4]
- Indicative of declining ecosystem health

PROBLEM STATEMENT

Do MPAs help preserve biodiversity in the Bay Area, and if they do, to what extent?

Increasing the size and number of marine protected areas (MPAs) is widely seen as a way to meet ambitious biodiversity and sustainable development goals. Yet, debate still exists on the effectiveness of MPAs in achieving ecological and societal objectives.

-Linwood H. Pendleton

Literature Review

LIT REVIEW

Reducing Human Impact Through MPAs

- Introducing humans to marsh ecosystems disrupts their natural behavior[5]
- Solution: MPAs lead to ecological success, which leads to economic success, which feeds back into stronger implementations of MPAs[6]. This creates a positive feedback loop

Climate Change[7]

- Marsh ecosystems at risk of inundation
  - Previously, marsh ecosystems coped with sea level rise by moving inwards
  - Human industrialization removed that option

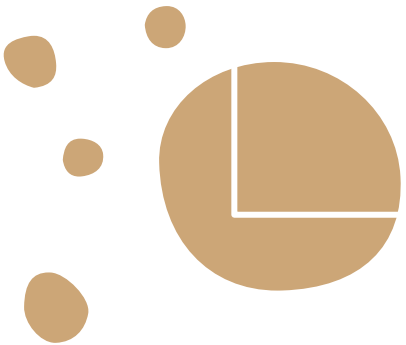
Risks of MPAs[8]

- Most MPAs are not strongly protected enough to have a meaningful impact
- If MPAs are not carefully managed, the cost of implementation will outweigh the environmental benefits
- Other conservation methods may be more useful at times

MPA Timeline[9]

- Older MPAs show more significant results than newly implemented ones
- It takes time for areas to show signs of improvement even after implementation

Research & Methodologies



Methods

- Shoreline Park: high human impact
- Bedwell Bayfront Park: moderate human impact
- Palo Alto Baylands: low human impact
- Each location was visited three times, at 1000, 1200, and 1600 hours*

* Only the observations taken at 1000 hours were used in this study, since this time period had the most accurate bird count

- Quantitative observations were taken
- Data was taken on the number of each species present
- The goal for this process was for the information to be effectively used to identify common themes and changes in perspectives between three different sites based on human impact level

Data & Analysis

Summary of Biodiversity Indices Organized by Site and Location

Location	Shannon-Wiener diversity index	Species Evenness	Species Richness	Total Number of Individuals	Average Population Size
Baylands	1.47	0.819	6	683	115
Bedwell Bayfront Park	1.32	0.678	7	561	80.1
Shoreline Park	1.22	0.626	7	402	57.4

Table 1. Population diversity, species evenness, species richness, the total number of individuals, and average population size at each site

Analysis

- More concentrated human disturbance results in a decrease in the biodiversity and abundance of marsh birds
- The Shannon Wiener Diversity Indices is inversely related to the assumed intensity of human disturbance of the sites; human activity negatively affects the biodiversity of marsh bird communities
- With more human disturbance, the community structures shift away from homogeneous average population sizes towards having larger differences in population size
- The uneven distribution of community composition implies early signs of an ultimate decrease in biodiversity and potential artificial selective pressure caused by human disturbances for generalists and against specialists

THANKS!
QUESTIONS?

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