Influences of Drawdown on Waterbird Use of Mudflats in Kentucky Reservoir


Kentucky Reservoir

INVERTEBRATES AND MOIST-SOIL SEEDS
Kentucky Reservoir

- Flood Prevention
- Hydroelectric Power Production
- Navigation
- Recreation

Reservoir Management

- Prior to 1980 – drawdown initiated in June; mudflats exposed mid-July
- 1980 – drawdown delayed until July 5; mudflats exposed mid-August

- Recent legislation – delay drawdown until after Labor Day

Reservoir Operations Study (ROS)

Reservoir Operation Study

- Regional Assessment and Management of Inland Stopover Habitats for Shorebirds in the Tennessee River Valley

- What shorebird species migrate through the valley, and in what numbers?
- When do they migrate through?
- Where do shorebirds stopover in the Valley?
- How does TVA management of the river system affect stopover habitats?
Comparison of two east Tennessee reservoirs at different drawdown dates

Preliminary Results

Shorebird use is significantly affected by drawdown dates.

Study Site
Kentucky Reservoir

<table>
<thead>
<tr>
<th>Study Sites</th>
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<tbody>
<tr>
<td>Eagle Creek</td>
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</table>

Scan each mudflat 2X/week

Permanent survey point

Between sunrise and 5 hrs after sunrise

Swarovski® 20-60x

August → December 2006/2007
Methods

Scan 180° at maximum 60X

Species-Specific Abundance

Statistical Analysis

Mean Daily Abundance among Months (2007)
Test: Repeated Measures ANOVA

Mean Richness among Months (2007)
Test: Repeated Measures ANOVA

% Composition among Months (2006/2007)
Test: Chi Square Test of Homogeneity

*shorebirds and waterfowl

Water Level and Shorebird Total Daily Abundance Correlation
Test: Pearson Correlation; Least-squares Regression

All tests performed at $\alpha = 0.05$ using SAS® system

Shorebird Mean Daily Abundance

$p = 0.09$

No Difference Between Months

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Daily Abundance</th>
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<tbody>
<tr>
<td>August</td>
<td>10</td>
</tr>
<tr>
<td>September</td>
<td>60</td>
</tr>
<tr>
<td>October</td>
<td>10</td>
</tr>
<tr>
<td>November</td>
<td>10</td>
</tr>
<tr>
<td>December</td>
<td>10</td>
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August | September | October | November | December
Shorebird Mean Daily Abundance (excluding Killdeer)

- September > October, November, December

Waterfowl Mean Daily Abundance

- No Difference Between Months

- $p = 0.2$

Shorebird Mean Richness

- September > all other months

- $p ≤ 0.001$
Waterfowl Mean Richness

No Difference Between Months

\( p = 0.3 \)

Shorebird Species Composition

2006/2007 Combined

\( \rho \leq 0.001 \)  \( S_{total} = 26 \)

Most Common - Killdeer

\( n = 12,375 \)

42%

Total Shorebirds

\( n = 23,779 \)

Uncommon Species

- American Avocet
- Ruddy Turnstone
- Baird’s Sandpiper
- Wilson’s Phalarope
- Red-throated Sandpiper
- Willet
- Piping Plover

Shorebird Species Composition

2006/2007 Combined (excluding Killdeer)

\( \rho \leq 0.001 \)  \( S_{total} = 25 \)

Most Common - Least Sandpiper

\( n = 4,707 \)

41%
Waterfowl Species Composition
2006/2007 Combined

<table>
<thead>
<tr>
<th>Richness (%)</th>
<th>Aug 6</th>
<th>Sept 10</th>
<th>Oct 13</th>
<th>Nov 17</th>
<th>Dec 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Waterfowl</td>
<td>107,851</td>
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</table>

Most Common - Gadwall

Clayton Ferrell (USFWS)

Correlation of Water Level and Shorebird Abundance
2006

Correlation of Water Level and Shorebird Abundance
2007

Initial Mudflat Exposure

Pearson Correlation, $r = -0.42$
$R^2 = 0.17$

Pearson Correlation, $r = -0.36$
$R^2 = 0.13$
**Potential Mechanisms Influencing Results**

- Migration
- Temperature
- Hunting Pressure
- Available Habitat
  - Mudflat acreage at a given lake elevation
- Microhabitat Factors
  - Soil moisture/compaction
  - Soil Temperature
  - Food Availability
  - Vegetation Response

**Future Analysis**

*Time Series*

Identifying the nature of a phenomenon (i.e., migration) represented by the sequence of observations

**Influencing Factors**

- Mudflat acreage
- Invertebrate Abundance
- Soil Temperature
- Soil compaction
- Soil Moisture
- Vegetation
- Hunting pressure

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