Use of Monitoring Instrumentation to Assist Management of an Illinois River Floodplain Restoration Site

Floodplain Restoration at Emiquon
Emiquon Project Area

TNC's Emiquon Preserve
7,000 ac.

USFWS Emiquon NWR
2,200 ac.

DNR

USFWS Chautauqua NWR
4,388 ac.

2 Miles
Illinois River Conservation Goals

December 1998

Reconnect an additional 25% of the historic floodplain to the river to provide additional habitat for *Boltonia decurrens*, large river floodplain communities, fish spawning, and fish feeding.
Emiquon - COE 206 Project

- 5,400 acres of floodplain restoration
- Reconnection “gate” structure in mainline levee
- A weir and water intake structure for Sister Creek
- Hardened overflow section of levee
Broad-Scale WQ Impacts

Pre-Restoration Data (July 2004 to June 2006)

• Measurements at three sites
  1) Ammonia, 2) Nitrate, 3) Organic Nitrogen, 4) Total Phosphate

Nitrate

- Nitrate concentrations over three years (2004-2006)
- Data from Illinois River, Pump Station, Sister Creek
- Seasonal variations in nitrate concentrations

mg NO₃⁻-N/L

- Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

2004

2005

2006

Sister Creek
Dry
Monitoring & Evaluating at Emiquon --

Monitoring & Evaluating at Emiquon --

- Framework for evaluating the success of Conservancy conservation work (Parrish et al. 2003).

  (1) identification of a limited number of **focal conservation targets**,  
  (2) identification of **key ecological attributes** for these targets,  
  (3) identification of **indicators** for each attribute, and  
  (4) the **rating** of target status based on whether the target's key attributes are within acceptable ranges.
<table>
<thead>
<tr>
<th>Target</th>
<th>Key Ecological Attribute</th>
<th>Indicator</th>
<th>Desired Range</th>
<th>Notes</th>
<th>Basis for Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Fish community assemblages</td>
<td>Number and percentage of native species populations</td>
<td>At least 25 native species represented (30+ native species very good); native species &gt;50% numbers and biomass (VG = &gt;75% numbers and biomass)</td>
<td>Theiling et al. (1999) show that flooding can increase fish diversity.</td>
<td>Expert review (ESAC II Animal breakout group) &amp; D. Blodgett</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Fish community composition</td>
<td>Native predatory fish population</td>
<td>100/hr catch rate (electroshocking) for Bass; Plus Bowfin present</td>
<td></td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Spawning</td>
<td>Water dissolved oxygen</td>
<td>4ppm Oxygen (Very Good = &gt; 5ppm)</td>
<td></td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Spawning</td>
<td>Substrate variability and structure (macrophytes and large woody debris)</td>
<td>Subset representing several of the following types present: diverse shoreline, shade, fallen trees, open areas, and emergent, floating-leaved and submerged plants. (Very Good = all types present).</td>
<td></td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Spawning</td>
<td>Frequency of Apr/May connection to the River</td>
<td>Every three years for long-lived species; more frequently for short-lived species (Annual connection would be very good).</td>
<td>Note: avoid carp spawning time if possible, Carp spawn Jul-Aug.</td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Nursery</td>
<td>Accessibility for riverine fish</td>
<td>Presence of young-of-the-year freshwater drum, goldeye, bigmouth buffalo (all of the above plus paddlefish = very good).</td>
<td></td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
<tr>
<td>Fish (riverine &amp; backwater)</td>
<td>Nursery</td>
<td>Native fish larvae</td>
<td>Dominance of native species</td>
<td></td>
<td>Expert review (ESAC II Animal breakout group)</td>
</tr>
</tbody>
</table>
The main premise of TNC’s conservation framework is that **key ecological attributes must be managed and conserved** to sustain each conservation target (Parish et al. 2003).
Monitoring & Evaluating at Emiquon --

- The main premise of TNC’s conservation framework is that key ecological attributes must be managed and conserved to sustain each conservation target (Parish et al. 2003).

- By explicitly identifying such attributes, land managers can specify what elements of a specific conservation target are important to manage and monitor in order to assess conservation progress.
Illinois River Conservation Targets:

- Floodplain Vegetation
  - Submersed Aquatic Vegetation
  - Emergent/Floating-leaved Vegetation
  - Moist Soil Vegetation
  - Floodplain Forest
- Boltonia decurrens (Decurrent False Aster)
- Fish (riverine and backwater)
- Mussels
- Migratory Birds
WQ Attributes

**Water Clarity**
- Submersed Aquatic Vegetation

**Dissolved O\(_2\)**
- Fish

**H\(_2\)O Temperature**
- Fish

**Hydrology**
- Submersed Aquatic Vegetation,
- Emergent/Floating-leaved Vegetation
- Moist Soil Vegetation
- Floodplain Forest
- *Boltonia decurrens*
- Fish
- Migratory Birds (waterfowl & Shorebirds)
YSI EcoNet and Meteorological Station sites at Emiquon Preserve

Data are online at:
www.uis.edu/emiquon/research/livedata.html
Water Surface Elevations at Emiquon

Elevation

Last year of farming

Restoration begins

Area (ac.)

2,381
1,215
591
295
149
70
8
Approximations:

- Dec 2007
- 423.5 ft msl
- 400 acres
- 300 M gal
Approximations

Dec 2007
423.5 ft msl
400 acres
300 M gal

May 2008
428.5 ft msl
2000 acres
1.9 B gal
Data Summary: Turbidity

Pump Station YSI

|---------Pre-Restoration-------------| |-------Restoration-----------|

Turbidity (NTU)

| 2006 | 2007 |

Maximum
Minimum
Daily Average
North-South Transect

East-West Transects

YSI EcoNet
Multi-parameter collecting stations

Hobo Samplers
• Top & bottom water
• Light & temperature

TNC's Emiquon Preserve

USFWS Chautauqua NWR

USFWS Emiquon NWR

Illinois River

North-South Transect

USFWS Chautauqua NWR

East-West Transects
<table>
<thead>
<tr>
<th>Source</th>
<th>Interval</th>
<th>Nutrients</th>
<th>Turbidity or secchi</th>
<th>Temperature</th>
<th>Chlorophyll</th>
<th>pH</th>
<th>Oxygen</th>
<th>Conductivity</th>
<th>Depth</th>
<th>Light</th>
<th>Weather station</th>
</tr>
</thead>
<tbody>
<tr>
<td>YSI EcoNet Stations</td>
<td>15 min.</td>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>(x)</td>
</tr>
<tr>
<td>YSI Handheld Units (14 sites)</td>
<td>1-2 wks</td>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<tr>
<td>Hobo Samplers (UIS)</td>
<td>1 hour</td>
<td>×</td>
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<td></td>
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<td>×</td>
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<tr>
<td>Fish &amp; Veg. Sampling (INHS)</td>
<td>monthly</td>
<td>×</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>×</td>
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<tr>
<td>Pump Station Sampling (EPA)</td>
<td>• 2 wks</td>
<td>×</td>
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<td></td>
<td>• During pumping</td>
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<tr>
<td>Bacteria Study</td>
<td>2 wks</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>
Here’s where you will find:

- Water Temperature
- Dissolved Oxygen
- pH
- Turbidity
- Conductivity

- Water Depth
- Wind Speed & Direction
- Rainfall
- Air Temperature
- Barometric Pressure
Thanks to our partners...