Trade-offs in Wetland Ecosystem Services in Working Landscapes

Identification, spatial scale, and management implications

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Wetland Ecosystem Services in Working Landscapes

Part I
• Wetlands in working landscapes
• Trade-offs in ecosystem services
• Introduction of session speakers

Part II
• Spatial trade-offs
• Key future directions
From Krummel and Dyer, 1984
### Wetland ES in working landscapes

<table>
<thead>
<tr>
<th>Wetland Ecosystem Service</th>
<th>Wetland Ecosystem Function</th>
<th>Service Classification</th>
<th>Scale of influence/benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>Water storage</td>
<td>Provisioning</td>
<td>Local</td>
</tr>
</tbody>
</table>
Landowner desires

Water Storage

Biodiversity

Primary production

Climate amelioration

Filter Nutrients

Downstream Ecosystems (watershed scale)

Policy

Local Ecosystem

Sanjay Shukla

Diane DeSteven

Chip Euliss

Jos Verhoeven

Patrick Bohlen

Chris Joyce

Lauch Fraser

Economic

Betsey Boughton
MacArthur Agro-ecology Research Center

- Cow calf 3,000 head
- 10,500 acres
- ~5,500 improved
- ~4,500 semi-native
- Bahia sod
- Hunt lease
Northern Everglades
Land Use and Wetlands in the Northern Everglades

Agricultural Landuses
- Citrus Groves
- Croplands/Pasture
- Field/Row Crops
- Improved Pasture
- Other Agriculture
- Plantations
- Semi-native Pasture
- SugarCane

Wetlands are 24% of entire watershed
- marshes
- seasonal wetlands

Lake Okeechobee

Estuary

Everglades
Regional Downstream Ecosystem: Lake Okeechobee

- Receives 558 metric tons of P/year
- 140 MT/year is target (meet by 2015)
- 51,000 MT of P in sediment
What happens to local ecosystems when we manage primarily for regional downstream ecosystem benefits?
Local Ecosystem Managed for Regional Watershed: Lykes West Waterhole Marsh
## Lykes West Waterhole Marsh – Results 2008-2011

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention (%)</td>
<td>60</td>
<td>94</td>
<td>92</td>
</tr>
<tr>
<td>Metric Tons of P</td>
<td>4</td>
<td>8.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>
P reduction to regional watershed but expanding cattail on-site
High storage value, low biodiversity value?

Low Elevation

Higher Elevation

Non-native Percent Cover

Average plant richness per m²
Landowner desires:
- Water Storage
- Biodiversity
- Primary production
- Climate amelioration
- Filter Nutrients
- Downstream Ecosystems

Local Ecosystem:
- Wetland Ecosystem Services

Policy:
- Local Ecosystem

Economic:
- Wetland Ecosystem Services
Many programs available for landowners to establish wetland functions and services

- Wetland Reserve Program
- Conservation Reserve Program
- Conservation Reserve Enhancement Program
- Environmental Quality Incentives Program
- Wildlife Habitat Incentives Program
- Payment for Environmental Services
Conceptual Model of Trade-offs in Ecosystem Services in relation to on-site, off-site and cost.

![Conceptual Model of Trade-offs in Ecosystem Services](image-url)
Future Directions

- How do we identify trade-offs and make management decisions?
  - Tabulation
  - Wetland ecosystem modeling
  - Decision support tools
  - Landscape bundling (too coarse grained?)
- Valuation of ES – is it possible?
- Cumulative effects of programs (local/regional)
- Spatial trade-offs (whether the effects of the trade-off are felt locally or at a distant location)
- Temporal trade-offs (whether effects take place rapidly or slowly)
- Reversibility (the likelihood that the perturbed ES may return to its original state if perturbation ceases)
Photo credit: Carlton Ward

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Questions?