Effectiveness of Compensatory Mitigation and Wetland Management
Effectiveness of Wetland Mitigation

- National Research Council 2001
  - Net Loss in Wetland Area
  - Net Loss in Wetland Function

- Mitigation Success
  - Highly successful
  - Highly unsuccessful
## Natural vs. Mitigation Wetland Function (OEPA, 2004)

<table>
<thead>
<tr>
<th>Function</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrology</td>
<td>Mitigation sites dryer</td>
</tr>
<tr>
<td>Soil Organic C</td>
<td>Natural 4.8 x mitigated</td>
</tr>
<tr>
<td>Soil Nitrogen</td>
<td>Natural 4.3 x mitigated</td>
</tr>
<tr>
<td>Soil P</td>
<td>Natural 1.6 x mitigated</td>
</tr>
<tr>
<td>Vegetation Index</td>
<td>Natural 2 x mitigated</td>
</tr>
<tr>
<td>Biomass</td>
<td>Natural 1.7 x mitigated</td>
</tr>
<tr>
<td>Macroinvertebrate</td>
<td>Richness Natural 1.6 x mitigated</td>
</tr>
<tr>
<td>Amphibian</td>
<td>Similar</td>
</tr>
</tbody>
</table>

Natural n=9, Mitigation n=10
## Factors Contributing to Success

<table>
<thead>
<tr>
<th></th>
<th>Adequate source of hydrology</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Same consultant</td>
</tr>
<tr>
<td>3</td>
<td>Good site selection</td>
</tr>
<tr>
<td>4</td>
<td>Oversight and follow-up by Regulatory Agencies</td>
</tr>
<tr>
<td>5</td>
<td>Designer on-site during construction</td>
</tr>
<tr>
<td>6</td>
<td>Good mitigation design</td>
</tr>
<tr>
<td>7</td>
<td>Native seed source present</td>
</tr>
<tr>
<td>8</td>
<td>Maintenance conducted on site</td>
</tr>
<tr>
<td>9</td>
<td>Irrigation for at least 1 growing season</td>
</tr>
<tr>
<td>10</td>
<td>Hydrologic monitoring prior to construction</td>
</tr>
</tbody>
</table>

Johnson et al. 2002
## Factors Contributing to Lack of Success

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No irrigation of planted materials</td>
</tr>
<tr>
<td>2</td>
<td>Poor site selection</td>
</tr>
<tr>
<td>3</td>
<td>Lack of maintenance</td>
</tr>
<tr>
<td>4</td>
<td>Poor mitigation design</td>
</tr>
<tr>
<td>5</td>
<td>Lack of hydrologic monitoring prior to construction</td>
</tr>
<tr>
<td>6</td>
<td>Lack of follow-up by Regulatory Agencies</td>
</tr>
<tr>
<td>7</td>
<td>Compacted soils</td>
</tr>
<tr>
<td>8</td>
<td>A buffer too small or unvegetated</td>
</tr>
<tr>
<td>9</td>
<td>Lack of consistency between goals and plan</td>
</tr>
<tr>
<td>10</td>
<td>Lack of experience</td>
</tr>
</tbody>
</table>

*Johnson et al. 2002*
National Compensatory Mitigation Action Plan

- 17 Actions to be completed by 2005
- General
  - Regulatory Guidance
- Integrating Mitigation into Watershed
  - On Site/Off Site & In-kind/Out of Kind guidance
  - Vegetated Buffer Guidance
  - Preservation Guidance
  - Watershed Context Guidance
- Improving Accountability
  - Banking Guidance
  - Grants to Improve Mitigation
  - Guidance for “Difficult To Replace” Areas
  - Stream Mitigation
National Compensatory Mitigation Action Plan (cont.)

- Clarifying Performance Standards
  - Model Mitigation Checklist
  - Adapt NAS-guidelines to 404 Program
  - Analysis of Existing Standards
  - Clarify Performance Standard Concepts
  - Performance Standard Guidance

- Improving Data Collection
  - Evaluate Existing Mitigation Databases
  - Develop Common Mitigation Databases
  - Annual Report Card
Wetland Management

- Manipulate wetland to perform one or more functions

- Examples:
  - Flood Storage
  - Wildlife Habitat
  - Resource Recovery
  - Water Quality Treatment
Flood Storage

- Napa, California

- Objective:
  - Allow bermed floodplain wetlands to function as flood storage and relieve downstream flooding

- Activities
  - Remove Most Existing Dikes
  - Buy River-Adjacent Properties
  - Relocate 16 Households
  - Raise Bridges
  - Farms Remain and Will Flood

- $220 Million 600 Acres
- 20 Years
Location of Project
River During Spring Flooding
Wildlife Habitat

- Troutdale, Oregon
  - Sandy River Delta
  - Reed Canary Grass Dominated

- Objective
  - Increase Plant Diversity
  - Increase Ponding
  - Increase Waterfowl Habitat

- Management Effort
  - Minor Excavation
  - Water Control Structures in Outflow Ditches

- $65,000 (Ducks Unlimited/USFS)
- 50 Acres 2 Years
Ditch System at Site
Planned Ponding
Resource Harvest

- **Forest Products**
  - Palustrine Forest Wetlands
  - Bottomland Forests
    - Hardwoods (Shade Intolerant)
    - Clearcut/Reforest
    - Limit Soil Compaction
  - Black Spruce Peatlands
    - Minimize Surface Damage
    - Avoid Soil Compaction

- **Aquaculture**
  - Mangroves is Southeast Asia
  - Net Pens in US
Bottomland Hardwood Stand
Aquaculture in Mangroves
Net Pen Aquaculture
Water Quality Treatment
Pathways of Treatment
Subsurface Treatments Systems
Effect on Concentrations

Nitrogen

Phosphorous
Treatment (Removal) Efficiencies
Fate of Phosphorous

Fourteen Year Phosphorous Budget, Kilograms

- Wastewater = 22,200
- Precipitation = 80
- Gaseous = 0
- Run-in = 20
- New Biomass = 7,000
- Burial = 15,200
- Runoff = 400