TIDAL MARSH RESTORATION
DO MORE OR DO LESS?

A DISCUSSION OF RESTORATION TECHNIQUES FOR
RECENTLY CONSTRUCTED TIDAL RECONNECTION PROJECTS

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Outline

- Background & challenges in Columbia R. Estuary
- Purpose
- Methods & scope
- Tidal wetland restoration - 2 case studies
- Take-home considerations
Lower Columbia River Estuary

- 75% loss of tidal off-channel habitat\(^1\)
  - Development
  - Agriculture
  - Hydropower
  - Many others

\(^1\) Bottom et. Al 2005
Challenges

Science
• Physical/ecological
• Limited monitoring funding
• Still evolving

Legal
• Pressures on agencies
• Deadlines
• Site scarcity

Photo courtesy of NPS
Purpose

- Inform the state of the art
- Applicability of passive & active approaches
- Improve project evaluation (identification, ranking)
- Improve project implementation (design, construction)
A TALE OF TWO FORTS

- Contrast two recently constructed projects
- Tidal, off-channel salmonid habitat
- Passive and active habitat creation methods
- Focus on “perched” wetlands
- Not relevant to subsided wetlands
Fort Columbia Tidal Reconnection

- Wetland cutoff by Hwy 101
- Fish passage culvert, wetland, LWD, reveg.
- Completed Spring 2011
- Pilot channel excavated
- Passive restoration

Freshwater Wetland
(Distributary of Chinook R.)
100 Acres

Existing “Perched” Culvert, 24” RCP

New 12’ x 12’ Culvert

BAKER BAY - COLUMBIA R. ESTUARY
(Washington)
Near Term Evolution
2-10 Years

Far Term Evolution
20-50+ Years

[Map showing evolution of Fort Columbia Tidal Reconnection areas]
Fort Columbia Tidal Reconnection

- Immediate & significant fish use
- Immediate channel response

2011 Salmonid Abundance Within Wetland

(Over 800 Trapped Outside of Culvert in April)
Fort Columbia Tidal Reconnection

- Looking D/S from Upper End of Wetland Channel
- Looking North at Upstream End of Channel
- Looking West Near End of Wetland Channel
- Looking East Near End of Wetland Channel
Channel Profile Adjustment

Elevation (Feet NAVD88)

Profile of Wetland Channel Thalweg (Feet)

New Culvert

MHHW EL +8.6

MTL EL +4.5

New Tidal Prism & Habitat

Approx. Limit of Construction

FLOW

Thalweg of Wetland Channel

Fort Clatsop

- National Historic Park
- Varied wetland habitat quality
- South Slough - 45 acres of diked pasture on dredge fill
- Elevations ‘high’ and earth compacted
South Slough

- New bridge in 2007 - improved connectivity
- Experimental passive approach - no pilot channel
- 4 years of monitoring
- Positive veg/fish responses in north
- South – somewhat reduced response
Slough Morphology

Downstream - Cross Section 2

- Deepening of Channel

Upstream - Cross Section 5

- Slight Widening
South Slough Wetland Response

- Increase in tidal prism & in-channel habitat
  - General transport out of wetland
  - Erosion up to 2 feet near mouth in first year
  - Profile adjusting, coming into new equilibrium
  - Rate of change may be slowing

- Limited new prism, particularly mid-, high tidal marsh range & overbanks
# A Tale of Two Forts - Comparison

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Fort Columbia</th>
<th>Fort Clatsop (S. Slough)</th>
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<tbody>
<tr>
<td>Channel Study Length</td>
<td>400 feet (new, growing)</td>
<td>700 – 900 feet (pre-exist.)</td>
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<tr>
<td>Channel Top Width</td>
<td>10 - 25 feet</td>
<td>10 - 40 feet</td>
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<tr>
<td>Wetland Elevations (Overbank)</td>
<td>+5 to +8’ NAVD88 (Mid- to Upper-Intertidal)</td>
<td>+8 to +10’ NAVD88 (Supratidal)</td>
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<tr>
<td>Thalweg Slope (+ = downstream)</td>
<td>+0.04% to +0.60%</td>
<td>-0.4% (adverse) to +0.5%</td>
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<tr>
<td>Hydrology</td>
<td>$Q_{\text{base}} \sim 1 - 5$ cfs</td>
<td>$Q_{\text{2yr}} \sim 50$ cfs</td>
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<tr>
<td>Predominant Soils</td>
<td>Medium Sands (~0.6mm, #30)</td>
<td>Fine Sands (~0.2 mm, #80)</td>
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<tr>
<td>Predominant Vegetation</td>
<td>Dense sedges, scrub-shrub</td>
<td>Pasture grasses</td>
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<tr>
<td>Ave. Annual Change in Prism</td>
<td>+1,100 CY/Year (First Year, +28%)</td>
<td>+300 CY (+5%)</td>
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Passive restoration has a chance …
- Sufficient hydrology
- Topography is within intertidal range
- Difficult to estimate vegetation impacts

Active restoration
- Not an either/or question
- Used in combination to kick-start
- Questions are… how much, how & where, when?

A Tale of Two Forts... what does the next chapter hold?
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- National Park Service – Fort Clatsop staff
QUESTIONS?
Citations
