Wetland Inundation Patterns and Vegetation Communities in the Lower Columbia River and Estuary

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Overview

- Background
- Conceptual Model
- Vegetation Patterns
- Inundation Patterns
  - Temporal variability
  - Spatial variability
- Why it matters
**Purpose of Research**

► **Goal**
- To better understand habitat structure and to improve restoration success by evaluating reference conditions.

► **Objectives**
- Evaluate status and trends of the estuary ecosystem
- Provide a means of evaluating restoration actions
- Inform restoration design
What are the bounds of the controlling factors?
Are there differences in the controlling factors and the ecosystem structures due to:
- Location (distance from the mouth)
- Wetland type
- Inter-annual variability
Study Sites

Multiple Projects
- Ecosystem Monitoring Program (LCREP – BPA)
- Reference Site Study (LCREP – BPA)
- Cumulative Effects of Ecosystem Restoration (USACE)
- Tidal Freshwater Research (USACE)
Wetland Types

- Brackish Marsh
- Tidal Freshwater Marsh
- Sitka Spruce Swamp
- Scrub Shrub Wetland
- Riparian Forested Wetland
Metrics

- Conducted elevation surveys in conjunction with vegetation surveys.
- Data collected along transects using systematic sampling with a random start.
- Elevation collected with Real Time Kinematic (RTK) GPS, with auto level for areas of high tree cover.
- Referenced to NAVD88.
- Water level sensors were surveyed to evaluate hydrology relative to wetland morphology.
Discriminant Function Analysis

Based on 44 sites, 30 plant species (out of 220)
Discriminant Function Analysis

Kunze: 4 groups

1 = 0-64 rkm coastal surge plain wetlands
2 = 65-105 rkm (surge plain wetlands)
3 = 106-225 rkm (overflow plain wetlands)
4 = 226-235 rkm (CR Gorge wetlands)

Spatial Variability

Avg site elevation (m, NAVD88)

Avg site elevation (m, CRD)

rkm

m, NAVD88

m, CRD
Inundation

- Sum Exceedance Value
Temporal Variability

- 3 sites
  - 2 in Reach F
    - Campbell Slough
    - Cunningham Lake
  - 1 in Reach H
    - Franz Lake

July 26, 2005

July 21, 2008
Temporal Variability

- Dominant species don’t change

![Graphs showing temporal variability in species cover over time for Cambell Slough, Franz Lake, and Cunningham Lake.](image)
Temporal Variability

- Boundaries between vegetation communities don’t change
- Vegetation cover within communities does change
Temporal Variability

Sum Exceedance Value

\[ SEV = \sum_{i=1}^{n} (d_{36}) \]

Conclusions

- Elevations of emergent wetlands cover a very narrow band
- Inundation patterns vary throughout the estuary
- Cover changes in response to changing water levels
- Overall vegetation in reference wetlands is stable and resilient to some variation in water levels
- Information on elevation and inundation patterns is critical to successful restoration.
Future Work

- Define elevation ranges for vegetation communities and inundation patterns for sites throughout the estuary.
- Evaluate spatial variability in SEV throughout the estuary.
- Calculate ranges of SEVs for individual species.
- Determine thresholds for invasive species.
- Disseminate information.

- Get feedback from restoration community (June SWG Meeting).