Assessing Habitat Compensation in the Lower Fraser River and Estuary

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Assessing Wetland Compensation and Examining Limitations to Native Plant Establishment in the Lower Fraser River Estuary

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Introduction

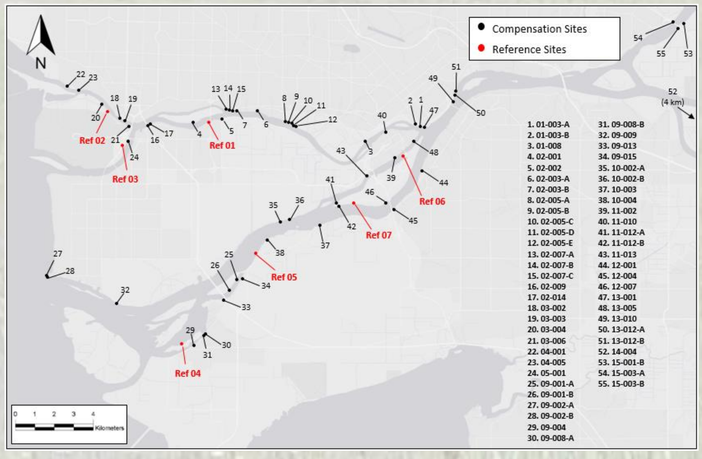
- Development projects in the Fraser River Estuary have been guided by the No-Net-Loss principle and Net Gain Objective, which aim to off-set unavoidable habitat loss through habitat compensation, restoration, and creation.
- Fraser River Estuary Management Plan (FREMP) compensation projects and their associated monitoring data are catalogued on the Community Mapping Network website in the FREMP-BIEAP Habitat Atlas.

Objectives:

1. Consolidate compensation site monitoring information and build upon existing database accessible via the FREMP-BIEAP Habitat Atlas
2. Revisit select compensation sites, use standardized methods to assess compensation success, and examine limiting factors to success.
3. Publish report of compensation assessments and make recommendations for current and future habitat compensation projects

Methods - Field

Vegetation surveys were conducted at 54 tidal marsh compensation sites and 7 reference sites, July – October 2015. Using 1 m^2 quadrats we identified and recorded all species, estimated their percent cover, recorded origin (native, exotic, invasive), recorded wetland indicator status, and measured the maximum stem height of all sedge and rush species. Compensation area and proportion of target habitat established was determined by walking the perimeter using a Trimble Geo 7x.



Methods – Analysis

- Mean percent cover of each species determined for each site.
- Species dominance calculated by:

$$absolute\ dominance\ (sp.x) = (mean\ \%\ cover)(frequency)$$

$$relative\ dominance\ (sp.x) = \frac{absolute\ dominance\ (species\ x)}{\sum\ absolute\ dominance\ all\ spp.}$$

- Site wetland indicator status = $\sum_{i-1}^{n}\left(\frac{species\ relative\ dominance}{100} \times species\ WIS\right)$
- Statistical analysis conducted: regression, ANOVA, ANCOVA

Results – Compensation Assessment

- Compensation success assessed on (1) Proportion target habitat established (Criterion 1) and (2) Proportion native species, normalized to reference sites (Criterion 2)
- Only 33% of wetland compensation sites ranked "Good" in both criteria. However, assessing the criterion individually, 65% of sites ranked "Good" for Criterion 1, and 50% for Criterion 2.
- Proportion of native species was the greater limiting factor to compensation success.

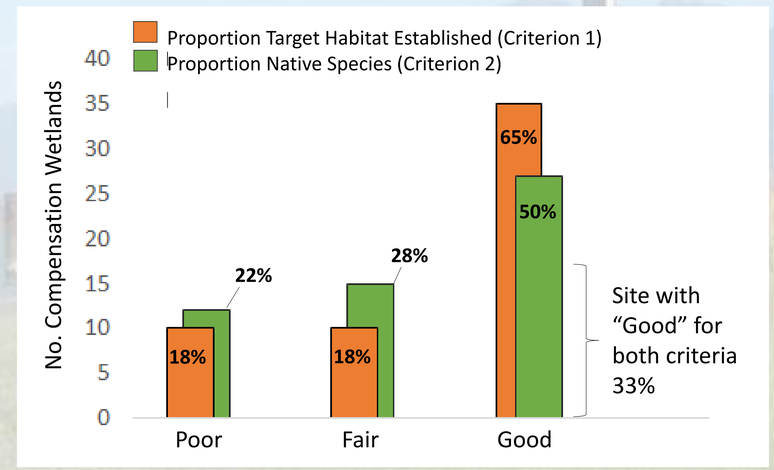


Figure 1: No. of compensation sites in each success rank category for criterion 1 & 2. Poor 0 – 64%, Fair 65-84%, Good >85%

Results – Native Species and *Carex lyngbyei*

The mean proportion of native species on compensation sites was 63% ± 7, compared with 77% ± 10 on reference sites. *Carex lyngbyei* is the most common native shoreline sedge in the Pacific Northwest and is often the target species for wetland compensation. It was found to be the dominant species in compensation sites and reference sites; however, it was twice as dominant on reference sites. Once established *C. lyngbyei* often creates monotype stands; therefore, the limiting factors to *C. lyngbyei* dominance may occur soon after site creation, while plants are poorly established.

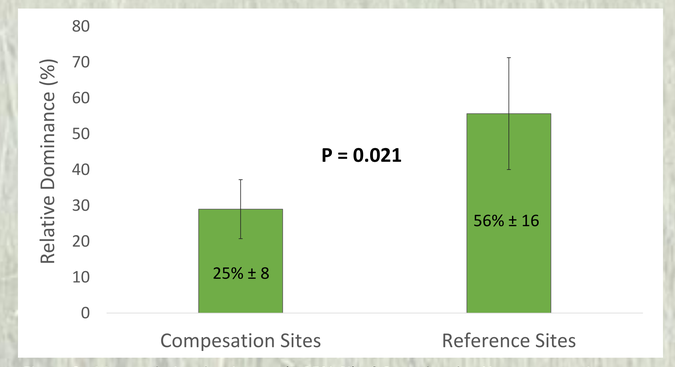


Figure 2: Mean relative dominance (± 95% CI) of *Carex lyngbyei* in compensation sites (N=54) and reference sties (N=7).

Results – Native Species Across Fraser River Estuary

The proportion of native species was found to negatively correlate with increased distance from the mouth of the river on compensation sites and on reference sites. Likely due to decreasing salinity and/or intensified urbanization.

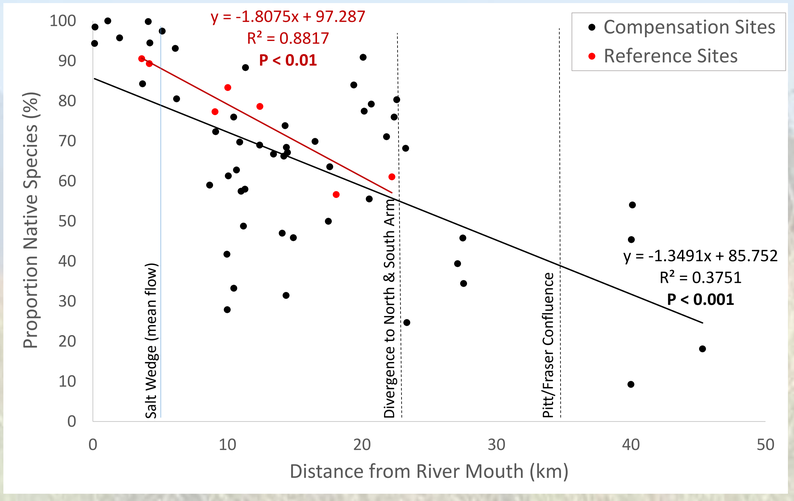


Figure 3: Proportion native species with distance from the mouth of the river. Compensation sites N = 52, reference sites N = 7.

Results – Wetland Indicator Status (WIS)

Wetland indicator status (WIS) (value 1 – 5) of a species reflects the likelihood that that species occurs in a wetland (lower value) or upland environment (higher value). Using species' dominance and WIS we can calculate *Site* WIS, which can reflect whether an entire site is more representative of a wetland or upland environment. Compensation sites had a significantly higher *site* WIS on average than reference sites. Increasing *site* WIS was found to correlate with increasing proportion of non-native species on both compensation and reference sites. Higher *site* WIS may be attributed to short submergence time or substrate type (poor water retention).

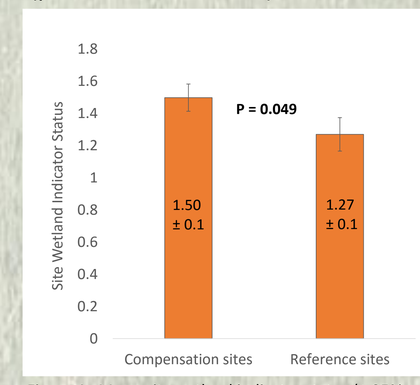


Figure 4: Mean *site* wetland indicator status (± 95% CI) for compensation sites (N = 54) and reference sites (N = 7).

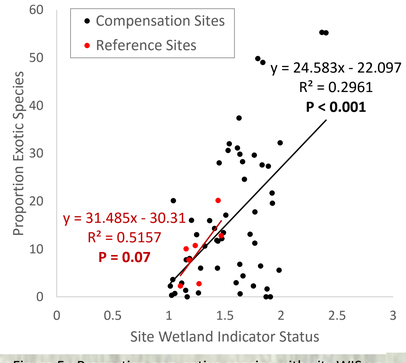


Figure 5: Proportion non-native species with *site* WIS on compensation sites (N = 54) and on reference sites (N = 7).

Recommendations for Future and Current Compensation Projects

- Employ adaptive management strategies in future compensation projects and to restore poorly-functioning existing compensation sites.
- Increase monitoring and employ adaptive management of Carex lyngbyei during initial years of establishment, mitigate losses where necessary, and control non-native species.
- Consider location along River (West – East) in monitoring plan and adaptive management strategies.
- Ensure adequate submergence time by verifying appropriate elevation and ensure appropriate substrate material is used in creation of compensation wetland.
- 2015 field data, compensation assessment, and monitoring reports available via FREMP-BIEAP Habitat Atlas interactive map: http://cmnbc.ca/atlas_gallery/fremp-bieap-habitat-atlas