Land Cover Change in the Lower Columbia River Estuary, 1880 - 2011

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Introduction

Summary

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The objective of this study was to compare digitized GIS interpretations of historical land cover maps with recent land cover map products derived from aerial and satellite imagery in order to assess changes in the landscape which have occurred since the late 1800s; before dikes, dams, agriculture, development, forestry, and other major anthropogenic disturbances were well established. The LCRE floodplain comprises an area of approximately 463,000 acres (including water), extending from the mouth at the Pacific Ocean 146 miles to Bonneville Dam, the upstream extent of tidal influence. Overall extent of the analysis was limited to approximately 401,000 acres, or 87% of the floodplain, by the availability of historical data

To characterize habitat, we considered vegetation (land cover) type, hydrology (wetland vs. upland) and tidal influence. We defined 'tidally influenced' as floodplain areas which are inundated by the main stem Columbia River as a result of two possible factors: 1) tidal forcing from the Pacific Ocean, and 2) river stage as a result of upstream flow contributions. We were particularly interested in quantifying changes in available tidally influenced wetlands. These habitats are critical for supporting juvenile salmon, as well as other species.

Each of the source data sets chosen for the analysis uses a unique land cover classification scheme. In order to effectively compare across data sets, it was necessary to aggregate all of these classes into a set of normalized classes which provided a basis of comparison.



Methods

'Current' Data Set

Current current land data was created for the Estuary Partnership by Sanborn Map Co. in 2010. The classification scheme was adopted from Garono (2003). Data was derived from 2009 NAIP imagery, with ancillary LiDAR and LandSAT data. The classification process utilized a software segmentation process to generate high resolution, polygon based land segments, which were classified using a supervised classification algorithm



Classified land cover polygons Aerial image of the area the 2010 Estuary classified in map to the left Partnership land cover map.

Historical' Data Set The data set representing historical conditions was created from

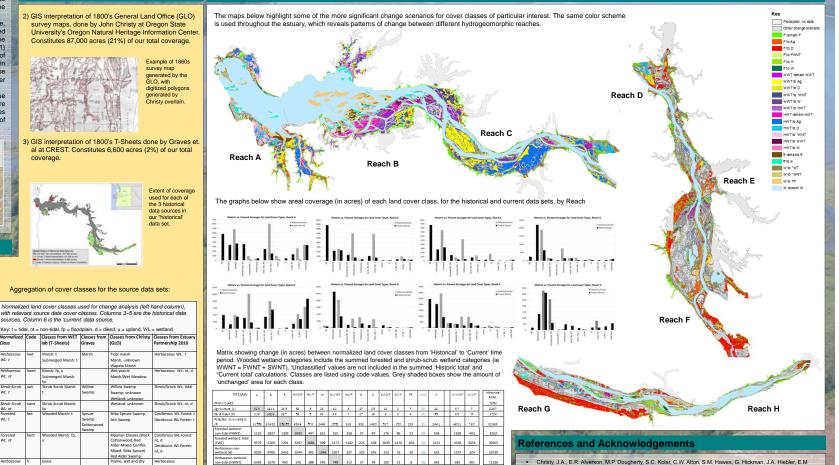
he following three sources:

1) GIS interpretation of 1800's Office of Coast Survey (OCS) topographic maps (T-Sheets) done by Jen Burke at University of Washington Wetlands Ecosystem Team (WET) lab. Constitutes 307,800 acres (77%) of our total coverage.



Change in land cover type over the past 130 years was evaluated for the floodplain of the Lower Columbia River Estuary (LCRE) by comparing digital GIS representations of late 1800's maps from the Office of Coast Survey and GLO with recent land cover data This analysis constitutes one level of a multiple lines of evidence Habitat Restoration Strategy being developed by the Estuary Partnership to help inform its restoration and conservation practices. Losses of 68–70 % were noted for vegetated tidal wetlands, which are critical habitats for juvenile salmonids that utilize the lower river and estuary. A loss of 55% of forested uplands was also noted. The majority loss of these habitats is attributed to conversion of land for agriculture, as well as significant loss to urban development We noted spatial patterns of change which varied within the lower river, and which may have practical implications for guiding restoration and conservation targets. The changes we noted are consistent with estimates derived from previous change enalyses done for the lower Columbia. We built on these studies by utilizing the most current source data sets, which allowed us to significantly extend the range of coverage, both spatially and temporally, relative to previous analyses. Our analysis covered approximately 87% of the flooplain area, and compared the current landscape to that which existed prior to the advent of major anthropogenic disturbance. Uncertainties in the results arise predominantly as a result of uncertainties in accuracy and quality of the historical data, as well as differences in methods for developing the historic and current data sets to be used for comparison. Despite these uncertainties, the results provide useful insight into the extent of change which has occurred in the Lower Columbia River Estuary

Results



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316 3111 3386 359 317 710 1274 10910

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- We would like to acknowledge Jennifer Burke, formerly of the UW Wetlands Ecosystem Team, for creating and sharing her geodatabase interpretation of the Office of Coast Survey Topographic maps. This data constituted the primary source of historical land cover information for this study.

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