

## **Development of an Ecosystem Classification System for the Columbia River Estuary**

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Systematic approaches to understanding the organization of highly variable and dynamic ecosystems often rely on classification and stratification of their hydrogeomorphic structure for both a conceptual and statistical framework. To better support research, monitoring, restoration, preservation, and other planning and management activities in the Columbia River estuary, we sought a hierarchical framework that would facilitate delineation of the diverse ecosystems and component landscape structures along the 233-km estuarine gradient from the ocean entrance to the base of Bonneville Dam. Review of the few existing approaches to classifying large river, tidal freshwater surge plain and estuarine ecosystems such as in the Columbia River estuary indicated that none effectively addressed tidal-freshwater ecosystems or were of sufficiently fine resolution to include geomorphic structure at the scales we needed to discriminate juvenile salmon habitat and other features of interest. Accordingly, we designed the Columbia River Estuary Ecosystem Classification System (“Classification”) to aggregate tidal surge plain, wetland and aquatic cover classes according to the ecosystem processes that structure landscape attributes at different spatial scales. The Classification is based on six levels, progressing from the coarsest, regional scale to the finest, localized scale: (1) Ecosystem Province; (2) Ecoregion; (3) Hydrogeomorphic Reach; (4) Ecosystem Complex; (5) Geomorphic Catena; and, (6) Primary Cover Class. Of the six hierarchical levels, the Ecosystem Complex and Geomorphic Catena levels are based on unique GIS analyses of bathymetric, geologic, geomorphic and biological attributes and potentially provide the most informative metrics of variable ecosystem state and biotic habitat structure applicable for research, monitoring and conservation planning. In particular, the geomorphic catena may prescribe some of the more diagnostic features of juvenile salmon habitat and the variability in landscape organization across the estuary. In describing the Classification, we focus on examples of these two levels for one hydrogeomorphic reach; we are currently acquiring the necessary datasets in order to complete the Classification for the remainder of the estuary, expected to be complete summer 2011.