ABSTRACT

We used 19th century coastal survey maps and contemporary air photos to assess historical changes in tidal wetland habitats (i.e., marshes, associated channels, and lagoons) associated with stream-delta (defined primarily by fluvial processes) and spit/marsh (defined mainly by longshore sediment processes) habitat complexes in the Strait of Juan de Fuca and Hood Canal regions. We assessed changes in the surface area of tidal wetlands associated with habitat complexes, and in the connectivity of habitats at multiple scales (i.e., local surface water connectivity and landscape scales). We also evaluated how ecological processes responsible for shaping tidal wetland habitats have changed because of human intervention. We provide maps, data summaries, and recommendations to help develop habitat conservation strategies.

We identified 250 habitat complexes (103 stream-deltas and 147 spit/marshes) across the study area, 63 in the Strait, 187 in Hood Canal. The historical size of complexes ranged from < 1 ha to 799 ha (Skokomish River estuary). Changes included an overall decrease in the amount of tidal wetland habitat (marsh, channel, and lagoon) associated with the habitat complexes from 1430 to 1327 ha (7%). Some sub-regions (e.g., Dabob Bay and Central Hood Canal) showed net gains in tidal wetlands, while other sub-regions (e.g., Central Strait, Port Townsend-Oak Bay, Entrance Hood Canal, North Hood Canal) lost considerable tidal wetland habitat. The numbers of spit/marsh complexes that provide surface water connectivity with adjacent waters (i.e., potential accessibility to juvenile salmon) decreased from 77 to 65, and tidal wetland habitat associated with these complexes was reduced from 449 to 351 ha. Therefore, on average, a migrating salmonid would currently encounter a tidally-accessible habitat complex less frequently and the amount of tidal wetland habitat available in these complexes is less today than historically. Also, the overall connectivity of much of the remaining tidal wetland has been impaired since the 19th century.

The most common direct ("footprint") causes of habitat change were attributed to fill associated with transportation infrastructure (including railroads) and residential development. Other important direct causes included urban, industrial, and military-related development, dredging and channelization activities, and diking and revetments. The gains in tidal wetlands observed in some sub-regions were attributed to delta progradation in the larger stream-delta estuaries, where salt marsh now extends seaward of its historic position, the likely combined result of increased sedimentation from watershed land use and river channelization activities. Longshore updrift causes of habitat change were typically less clear because direct causes (e.g., fill) often obscured drift cell-mediated effects on downdrift habitat complexes. To provide an indicator of habitat function, we developed a "Relative Condition" rating for most of the habitat complexes according to surface area changes in tidal wetland and the level of impairment to habitat connectivity within complexes. Overall, 22% of the rated complexes were considered "functional", 30% "moderately impaired", 31% "severely impaired", and 17% "lost". We used the Relative Condition rating to help develop habitat protection and restoration recommendations for individual complexes.