EVALUATING CUMULATIVE ECOSYSTEM RESPONSE TO RESTORATION PROJECTS IN THE COLUMBIA RIVER ESTUARY, 2008

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ABSTRACT

The restoration of tidal marshes and swamps, through hydrological reconnection and vegetation reestablishment (including riparian plantings), in the 235-km estuarine portion of the Columbia River is designed to improve juvenile salmonid habitat quality and ecosystem function. Restoration strategies are being implemented by a variety of governmental and non-governmental organizations. This study is establishing a framework by which to evaluate the effectiveness of individual projects as well as methods for assessing estuary-wide cumulative effects of restoration projects. As part of our effort, we released the final protocol manual for monitoring physical and biological metrics in 2008 following extensive field testing and multiagency review since 2004. We intended this manual to standardize data collection critical for analyzing changes following habitat restoration actions in the main stem from Bonneville Dam to the river mouth. The manual contains methods for monitoring fish, vegetation, land elevation, channel morphology, water levels, and landscape features. Our field studies in 2008 evaluated cumulative effects indicators for detecting a signal from restoration actions in the estuarine system focused on 1) fish use of restored sites, as indicated by the stomach contents of juvenile salmon captured onsite; 2) flux of nutrients and chlorophyll between restored sites and the main stem river; and 3) baseline monitoring of vegetation and land elevation prior to tide gate replacements at the Julia Butler Hansen National Wildlife Refuge. We also implemented field studies of three naturally breached sites (accidental dike breaches from the 1960s – 1990s) for the purpose of evaluating long-term restoration trajectories following hydrological reconnection. To evaluate these natural breaches, we used rapid assessment techniques based on the monitoring protocols; analysis of these data together with data from three natural breach sites proposed for 2009 will increase predictive accuracy regarding restoration outcomes in the estuary. Finally, we utilized an existing hydrodynamic model of the Grays River and hydrological data from specific sites to preliminarily evaluate the cumulative effects of various dike-breach scenarios as measured by wetted area and channel edge. Our results to date show that juvenile salmon access and spend time in restored wetlands almost immediately following hydrological reconnection. Further, organic matter, nutrients and prey resources produced in these restored systems appear to be exported to the river, and the model results provide verification of the inundation cycles on the sites and the interconnections among hypothetical restoration sites. Both juvenile salmon use and ecological processes important to the ecosystem can be improved by tidal reconnection of formerly diked tidal wetlands. In 2008, we proposed an adaptive management strategy for adoption in the region that would facilitate the continuing evaluation and improvement of these types of restoration actions in the lower Columbia River and estuary.