

Northwestern Division – U.S. Army Corps of Engineers
ANDROMOUS FISH EVALUATION PROGRAM
FY2013 RESEARCH SUMMARY

Study Code: EST-P-10-01

Fish Program Feature: SCT spreadsheet identifier (i.e. CRFM Project)

Title: Contribution of Tidal Fluvial Habitats in the Lower Columbia River Estuary to the Recovery of Diverse Salmon Stocks and the Implications for Strategic Estuary Restoration

Management Application: Estuary research funded through the CRFM AFEP supports the Corps and regions Columbia Estuary Ecosystem Restoration Program (CEERP). The goal of the CEERP is *to understand, conserve and restore ecosystems in the Columbia River Estuary*. This study supports this goal by executing critical uncertainties research. The subject study investigates four key questions: 1) How are genetic stock groups distributed through the estuary? 2) Do salmon life history, habitat use and performance vary by stock? 3) Which juvenile life histories contribute to adult returns and does estuarine habitat restoration benefit population resilience? And 4) How much restoration is needed to insure stock persistence? Findings will support Corps project planning and development. Findings contribute to our understanding of salmon ecology in the LCRE (e.g., establishing a best available science standard) and help answer key management questions including:

- What are the limiting factors or threats (i.e., stressors and controlling factors) in the estuary preventing the achievement of desired habitat or fish performance?
- What adjustments should be made, if any, to improve the ability of the SBU crediting method to predict benefits to ESA-listed fish from ecosystem protection and restoration in the LCRE?

As we answer these questions, we can make better decisions about habitat restoration (project selection, design and assessments) and RME efforts in the LCRE. Estuary research progresses actions under the 2008/2010 FCRPS BiOp:

- *Habitat Strategy 2* - Improve Juvenile and Adult Fish Survival in Estuary Habitat: **RPA 37** Estuary Habitat Implementation. Findings inform the Expert Regional Technical Group (ERTG) assigned survival benefit unit (ASBU) methods, specifically criteria for “certainty of success”, “habitat access/opportunity” and “habitat capacity/quality”.
- *RM&E Strategy 4* - Estuary Habitat and Ocean Research, Monitoring, and Evaluation: **RPA 58** Monitor and Evaluate Fish Performance in the Estuary: Study investigates salmon trophic relationships (prey availability and stomach content), consumption and growth rate; **RPA 59** Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions: Study will investigate migration and residence of juvenile salmon; and **RPA 61**: Investigate Estuary / Ocean Critical Uncertainties: Study investigates CRE contribution to salmon recovery (VSP).
- *Adaptive Management Actions* – **RPA 1** Implementation Plan, **RPA 2** Annual Progress Report, **RPA 3** Comprehensive RPA Evaluations: Meta-analysis will contribute to the implementation plan (CEERP Action Plan), annual progress reporting (CEERP Synthesis Memorandum) and comprehensive reporting (CEERP synthesis and evaluation of RME and project data).

Background: The subject study Contribution of Tidal Fluvial Habitats in the LCRE to the Recovery of Diverse Salmon Stocks and the Implications for Strategic Estuary Restoration builds upon finding reported in Estuarine Habitat and

Juvenile Salmon: Current and Historical Linkages in the Lower Columbia River and Estuary (DRAFT Final Report 2002-2008) (Bottom et.al.).

Study Goal: Determine the estuary's contribution to the spatial structure and life history diversity of Columbia River salmon stocks and the implications for estuary restoration.

Objective 1 – Genetic Stock Distribution: Characterize temporal and spatial distribution of Chinook genetic stock groups in tidal fluvial reaches of the LCRE (Rkm 75 to Bonneville Dam) ('10 – '11).

Approach: Systematically investigate genetic stock groups, distributed spatially throughout the estuary, year-round. * Pending completion based on 2010-2012 analysis – to be reported in the preliminary proposal.

Objective 2 - Stock-Specific Habitat Use: Investigate stock-specific habitat use, life histories, and performance of juvenile salmon in key habitats of reach F, C and B ('12 – '16).

Metrics: species presence and genetic stock id. (time and size at capture), residence time (PIT tagged fish), prey availability, consumption - stomach content and growth (measured from otoliths and scale increments), water depth and elevation, water properties (temperature, dissolved oxygen, etc.)

Objective 3 – Juvenile salmon rearing to adult return: Evaluate juvenile salmon life history strategies and their contributions to adult returns in selected tributaries (2014 – 2018).

Methods: Chemical analysis of adult Chinook otoliths from Grays, Coweeman, Lewis, Willamette, Sandy, Priest Rapids, Wenatchee, and Methow; Water chemistry of tidal tributary and main-stem sites to evaluate whether otolith barium can be used to reconstruct salmon entry into tidal-fresh environments; consider strontium marking – pending results from 2011 analysis.

Objective 4: Hydrologic and Life Cycle Modeling: Use hydrologic models and life-cycle models to evaluate estuary restoration needs and climate change effects on diverse salmon ESUs (2011 – 2015).

Approach: Study will apply a hydrologic model to simulate and characterize salmon habitat access/opportunity in tidal fresh water reaches under varying flow and bathymetric conditions.

- (a) Life cycle modeling: Evaluate the potential response of selected salmon ESUs from improvements to estuary rearing opportunities and salmon performance. Focus – stock-specific performance
- (b) Hydrological modeling: Model the dynamics of stock-specific habitat opportunities in the tidal-fluvial estuary in response to changing flow, temperature, depth, velocity, and climate conditions. Example, explore opportunities to integrate hydrodynamic model with other planning tools (e.g., Col River Ecosystem Habitat Classification System, Columbia River Treaty, etc.)

Objective 5 (NEW) - Disseminate Information and results. Make research findings and analytical tools accessible to habitat restoration planners, engineers, biologists, and researchers.

Approach: prepare written documents (design technical memorandums, co-author 2013 Synthesis Memorandum, and prepare Annual Research Report) present findings to AFEP SRWG, EP Science Work Group, and restoration sponsors; support transfer of technology.

Period of data collection: year-round, variable depending response variable

Schedule: FY 2011 to FY 2018

Related Research: The subject study will be coordinated with other estuary research, including: NEW Research Proposal: Synthesis of Research, Monitoring and Evaluation and Restoration Project Data in the LCRE: Data will be downloaded to and stored in the regional database (when available).

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