GRAYS RIVER WATERSHED RESTORATION

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Status Report 2008

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Introduction

The Bonneville Power Administration (BPA) Project 2003-013-00, *Grays River Watershed Restoration*, began in FY04 and continues into FY09. This status report is intended to summarize accomplishments during the period 1 November 2008 through 30 April 2009. Accomplishments are summarized for non-administrative Work Elements, as detailed in the Statement of Work (see BPA's project management database PISCES).

The Pacific Northwest National Laboratory (PNNL) is collaborating with the Columbia River Estuary Task Force (CREST) on implementation of the Grays River Restoration Project. The Grays River is vitally important to the recovery of Lower Columbia River (LCR) chum salmon because it currently has the most viable population remaining in the LCR region. The Grays River watershed is also important to the recovery of salmon and steelhead in the LCR ecosystem. Today, numbers of naturally spawning salmon and steelhead have declined to levels far below historical numbers because of habitat limiting factors that include but are not limited to the lack of habitat connectivity, diversity, channel stability, riparian function and altered stream flow conditions.

The objective of this project is to restore habitat-forming processes to enhance salmon and steelhead populations in the Grays River, following recommendations developed during the FY04-06 BPA-sponsored Grays River Watershed Assessment (BPA Project # 2003-013-00). Specifically, this project will be the first step in restoring channel structure and function that will increase instream habitat diversity, channel stability, and riparian integrity in the critical response reach upstream and adjacent to critical salmon spawning areas of the Grays River. The major component of this strategy is the planning, design, installation, and monitoring of engineered logjams (ELJ) that will rejuvenate historic channel and floodplain processes. Additional restoration measures include reforesting the riparian corridor to enhance future large woody debris recruitment and investigation of conservation activities within ecologically critical areas. These activities include land acquisition and levee removal to protect critical areas and reconnect floodplain areas. Finally, monitoring integrated with restoration activities is proposed to evaluate restoration effectiveness and allow for adaptive management of future restoration treatments in the project area as well as other degraded watersheds in the Lower Columbia River.

Progress by Work Element

Work Element C – Final restoration design adjustments

Work Product/Deliverables: Technical assistance to final project design drawings, specifications, and location.

PNNL assisted CREST and the selected engineering subcontractor (Anchor Environmental) with the final design and siting of the ELJ structures. Design alternatives review meetings were held in conjunction with the Grays River Working Group. As a result of the meetings, and meetings with the Gorley family, feedback provided verbally and electronically and a through CREST review, Anchor Environmental produced the final design alternatives analysis. The engineer is now proceeding with design of the preferred alternative. The ELJ structures will slow flood flows, reduce erosion, contribute to sediment storage in the project area, enhance fish habitat, and contribute large woody debris to the project area. These structures will also divert partial flow into alternate

channels within the Grays River floodplain, increasing total aquatic habitat area, restoring spawning habitat.

PNNL technical assistance for this work element included site visits to the study area, technical review meetings, and coordination meetings with CREST. PNNL also provided data management, analysis, and interpretation of existing data sets relevant to the Grays River restoration project.

Anchor staff are currently working on providing final design drawings.

Work Element D – Restoration monitoring and assessment

Work Product/Deliverables: Pre-restoration monitoring and assessment data

PNNL implemented the *Restoration Monitoring And Assessment Plan* (RMAP) developed during the FY07 phase of this project. The RMAP was to be developed according to the final restoration channel modifications to be implemented; however, restoration alternatives have not yet been identified, finalized, or implemented. Therefore, the RMAP was developed based on the best available restoration design information at the time. The RMAP is based on a Before—After (BA) study design for a quantitative assessment of changes in physical, hydrological, and biological characteristics associated with the restoration channel modifications. The RMAP is also designed to be adaptable to changes in the prescribed restoration designs. Accordingly, pre-restoration monitoring data collected by PNNL during FY08 included:

- establishment of permanent cross-sections for measuring channel bed elevations and monitoring other channel changes
- establishment of permanent photograph points and collection of photographs
- installation of water level data loggers at the cross-sections and other selected locations
- lateral surveys of channel bed elevation along cross-sections
- longitudinal surveys of channel bed elevation along the thalweg
- measurements of channel bed surface and subsurface grain sizes at cross-sections and other selected locations
- measurements of vertical hydraulic gradient (VHG) and hydraulic conductivity (K) via slug tests to estimate hyporheic exchange within salmon spawning areas and other selected locations
- inventory of existing large woody debris (LWD) and LWD jams
- acquisition of June 2008 Worldview-1 satellite image with 0.5 m resolution
- mapping of channel boundaries
- compilation of fall Chinook and chum salmon redd locations from WDFW

Work Element E – Data analyses

Work Product/Deliverables: Evaluation of pre-restoration processes; pre-restoration monitoring and assessment data, metadata, and statistical analyses

PNNL used the RMAP to guide the analyses of data collected under Work Element D. Data analyses during FY08 focused on pre-restoration evaluation of hydrologic and geomorphic processes, which included:

- hydrology (e.g., stage:discharge curves, hyporheic exchange, floodplain connectivity, etc.)
- geomorphology (e.g., sediment transport capacity, armoring ratios, longitudinal slope and bedforms, etc.)
- channel condition and habitat quality (e.g., substrate embeddedness, LWD frequency and type, pool frequency, residual pool depth, etc.)

The maps in Appendix A summarize the data availability.

Work Element F – Conference presentation

Work Product/Deliverables: One presentation to an appropriate scientific conference

Restoration construction activities have not yet been implemented. Therefore, monitoring data collected to-date represent only pre-restoration conditions, and implementation of the Before-After study design has not yet come to fruition. As such, project information is not yet timely for presentation at a scientific conference, and therefore a presentation was not delivered during FY08.

Appendix A. Maps of pre-restoration data availability.

Figure 1. A referencing system (hash marks with numbers) was established based on river kilometer distance from the mouth of the Grays River. The study area was divided into sub-reaches (colored lines; G1, G2, G3, G4, WF), with permanent cross-sections (yellow dots indicating endpoints) established throughout the study area. Water level recorders (green dots) were placed at six locations.

Figure 2. Satellite image from 28 June 2008 with polygons representing the active channel during the summer period of 2003, 2006, and 2008.

Figure 3. Satellite image from 28 June 2008 with cross-sections measuring the active channel width during the summer period of 2003, 2006, and 2008.

Figure 4. Locations of cross-section and longitudinal bed elevation surveys.

Figure 5. Survey of large woody debris (LWD) pieces and jams during November and December 2008.

Figure 6. Measurements of riverbed surface (digital photo processing) and subsurface (bulk sample sieving) grain size distributions during October 2008.

Figure 7. Measurements of vertical hydraulic gradient and riverbed hydraulic conductivity (slug tests) to be used with water level data for estimating (empirical and modeled) hyporheic exchange and floodplain hydrologic connectivity.