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Research article

An expert panel process to evaluate habitat restoration actions in the Columbia River estuary

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ABSTRACT

We describe a process for evaluating proposed ecosystem restoration projects intended to improve survival of juvenile salmon in the Columbia River estuary (CRE). Changes in the Columbia River basin (northwestern USA), including hydropower development, have contributed to the listing of 13 salmon stocks as endangered or threatened under the U.S. Endangered Species Act. Habitat restoration in the CRE, from Bonneville Dam to the ocean, is part of a basin-wide, legally mandated effort to mitigate federal hydropower impacts on salmon survival. An Expert Regional Technical Group (ERTG) was established in 2009 to improve and implement a process for assessing and assigning "survival benefit units" (SBUs) to restoration actions. The SBU concept assumes site-specific restoration projects will increase juvenile salmon survival during migration through the 234 km CRE. Assigned SBUs are used to inform selection of restoration projects and gauge mitigation progress. The ERTG standardized the SBU assessment process to improve its scientific integrity, repeatability, and transparency. In lieu of experimental data to quantify the survival benefits of individual restoration actions, the ERTG adopted a conceptual model composed of three assessment criteria—certainty of success, fish opportunity improvements, and habitat capacity improvements—to evaluate restoration projects. Based on these criteria, an algorithm assigned SBUs by integrating potential fish density as an indicator of salmon performance. Between 2009 and 2014, the ERTG assessed SBUs for 55 proposed projects involving a total of 181 restoration actions located across 8 of 9 reaches of the CRE, largely relying on information provided in a project template based on the conceptual model, presentations, discussions with project sponsors, and site visits. Most projects restored tidal inundation to emergent wetlands, improved riparian function, and removed invasive vegetation. The scientific relationship of geomorphic and salmonid responses to restoration actions remains the foremost concern. Although not designed to establish a broad strategy for estuary restoration, the scoring process has adaptively influenced the types, designs, and locations of restoration proposals. The ERTG process may be a useful model for others who have unique ecosystem restoration goals and share some of our common challenges.

1. Introduction

Changes in the Columbia River basin, such as habitat loss, hydropower development, operation of hatcheries, and fishing practices, have contributed to population declines and the listing of 13 salmon and steelhead populations as endangered or threatened under the U.S. Endangered Species Act (ESA; 16 U.S.C. §§1531–1544). Under ESA Section 7(a)(2), various Biological Opinions issued by the National Marine Fisheries Service (NMFS) have

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required management actions by the Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (USACE), and the U.S. Bureau of Reclamation to mitigate Federal Columbia River Power System (FCRPS) impacts on listed populations, hereafter referred to as "salmon." Among the prescribed mitigation actions is habitat restoration to increase the survival of wild juvenile salmon migrating through the Columbia River estuary (CRE) (Fig. 1) by about four million individuals over the 2007–2018 period (NMFS, 2008). NMFS (2008) directed an expert panel, the Expert Regional Technical Group (ERTG), to assign "survival benefit units" (SBUs) to proposed habitat restoration projects, following an approach based on the Estuary Module (NOAA Fisheries, 2006; updated in NMFS, 2011) and the 2007 Biological Assessment (USACE et al., 2007), referred to here as the "BA method" (described further in Section 4.2.1). In this paper, we describe the expert panel process developed to evaluate the potential effect of restoration actions on the survival of juvenile salmon migrating through the 234 km CRE.

Expert panels can help guide resource management decisions when objective data, time, or funds are limited (Oliver, 2002). For example, recent programs in forest management (Mendoza and Prabhu, 2000; Gomontean et al., 2008; Orsi et al., 2011), biodiversity conservation (Oliver, 2002), and ecological restoration (Doren et al., 2009) have used expert panels to propose broad ecological criteria and indicators for strategic planning and assessment, or to identify priorities from lists of potential metrics. Gordon and Gallo (2011) developed a decision-support application that used input from expert panels. Yet the effectiveness and outcome of panel processes have not been widely documented, and little guidance for such work is available. Moreover, consensus within expert panels is often difficult to achieve, especially when panels consist of many experts or require structured questionnaires (e.g., Delphi techniques) to gather information and interpret diverse opinions (Orsi et al., 2011). The subjectivity of expert panel decisions raises concerns about transparency and consistency (Young et al., 2004). Selection of appropriate indicators is often subjective, and complex or poorly defined criteria may contribute to inconsistent interpretations and scoring (Rochet and Rice, 2005). Accordingly, we provide some suggestions for the composition and operational approach of such expert panels, based on our experience with the ERTG.

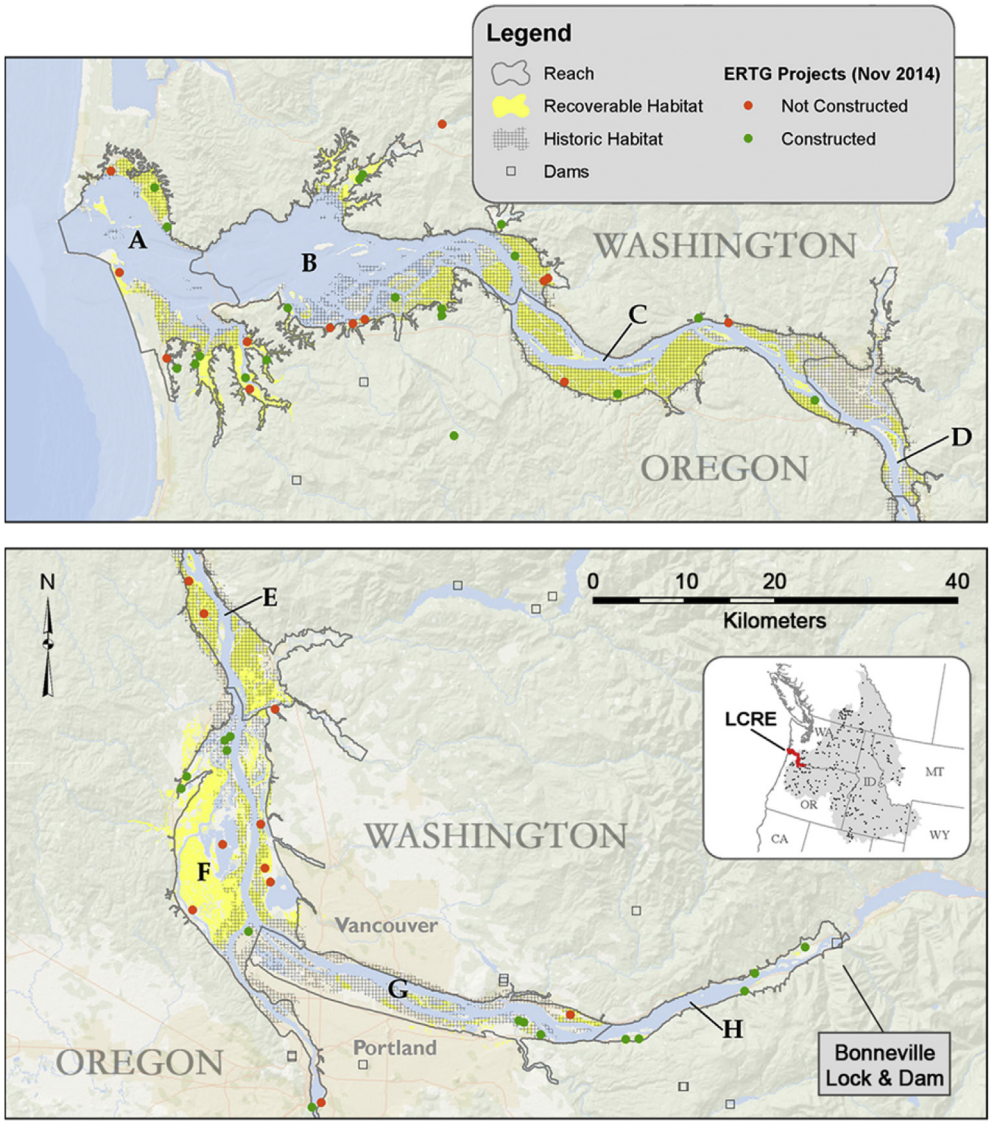

Fig. 1. Location of the Columbia River basin, estuary, and dams in North America (inset). The ERTG assesses restoration projects between Bonneville Dam and the outlet and in tidally influenced tributaries. Estuarine reaches (A–H) are delimited by physical processes (Simenstad et al., 2011).