

STUDY NO. 4: CROOKED RIVER TAILWATER BENTHIC INVERTEBRATE STUDY

4.1 Goals and Objectives - §5.9(b)(1) — Describe the goals and objectives of each study proposal and the information to be obtained

ODFW Proposal:

It is anticipated project construction may result in elevated sediment and turbidity levels in the Crooked River below Bowman Dam, despite efforts by OID to isolate the work area and contain sediment. Fine sediment in deposits or in suspension can reduce primary production and invertebrate abundance and thus can affect the availability of food within a stream (Cordone and Kelley 1961). The high densities of redband trout in this reach and extremely high combined biomass of redband trout and mountain whitefish is largely a result of the productive and diverse macroinvertebrate community.

The objectives of the study would be to collect information on the benthic invertebrate community in the Crooked River downstream of Bowman dam in respect to their habitat use and potential vulnerability to ramping and flow fluctuations associated with the proposed hydropower operations. This study would complement the proposed Study 7 regarding flow ramping and flow fluctuation evaluations.

OID Response:

OID understands the goal of this study is to establish a baseline condition of the macroinvertebrate community in the Crooked River below Bowman Dam. During construction of the project, OID would implement best management practices designed to avoid any potential deposition of sediments in the river. A sediment prevention plan will be included in the application for license. The pre-project data collected would serve as the baseline to determine the effects of a release of sediment to the river as a result of project construction.

It must be noted that the project would not control releases from the Bowman Dam, timing of releases, reservoir operations, or ramping rates. The project would utilize the opportunity to generate power from releases made from Bowman Dam. The Crooked River Collaborative Water Security and Jobs Act of 2014 establishes the quantities of water to be released from Prineville Reservoir including water to benefit fish and wildlife.

4.2 Relevant Resource Management Goals - §5.9(b)(2) — If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

ODFW Proposal:

ODFW's trout management policy identifies habitat protection, rehabilitation and enhancement as essential to maintaining wild trout production and are the primary management activities. It further states the productive capacity of waters will be maintained or enhanced so no net loss of natural production occurs (OAR 635-500-0105 and 0115.). Maintaining an adequate prey base is essential to meeting these goals and objectives.

ODFW has multiple resource management goals derived from Oregon statute and adopted rules that guide our recommendations in hydro licensing processes. Permeating each of these policies is the goal of protecting and restoring native fish and wildlife populations for use and enjoyment by present and future generations. Key directives to ODFW for implementing fish and wildlife management

strategies include; avoidance of impacts to these populations, protection of genetic diversity, and protection and restoration of natural habitats on which these populations are dependent.

OID Response:

The resource goal of this study is to establish the baseline condition of the macroinvertebrate community within the project effected area of the Crooked River. In the event the best management practices implemented to prevent sedimentation in the river were to fail, the baseline established by this study would serve as a means of assessing the effects of such an event.

4.3 Background and Existing Information - §5.9(b)(4) — Describe existing information concerning the subject of the study proposal, and the need for additional information.

ODFW Proposal:

Flow fluctuations generated from ramping at hydroelectric facilities for operational purposes can cause increased velocities and shear stress, bedload mobilization, and scour, all of which can contribute to decreases in species abundance, richness, and diversity. Decreases in invertebrate community measures can result from the initial physical disturbance causing increased macroinvertebrate drift, but can also result from changes in the community structure caused by response to chronic flow fluctuations. Over time, species that are more vulnerable to stranding and desiccation from lateral water surface changes or those more susceptible to entrainment during increased flows may be replaced by more tolerant species, thus altering community indices.

OID Response:

Symbiotics LLC performed a macroinvertebrate study of the Crooked River below Bowman Dam from 2004 – 2006 as part of its proposal to construct a hydroelectric project at Bowman Dam (FERC No. 11925). Three sites were sampled and evaluated at 0.2, 2.0, and 4.5 miles downstream of Bowman Dam. The results of this study indicated that density and biomass of benthic invertebrates was highest 2.0 miles downstream of the dam but lowest 4.5 miles downstream. Taxa richness was demonstrated to range from 16 at 0.2 miles to 9 at 2.0 miles. The site at 4.5 miles had a richness of 15. The Hilsenhoff Biotic Index was quite low for all three sites, indicating a high tolerance of the invertebrate community to organic and sediment pollution. The EPT Index was also high at all three sites indicating prevalence of species with a low tolerance to pollution.

4.4 Project Nexus - §5.9(b)(5) — Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

ODFW Proposal:

Studies of benthic invertebrates have been used to evaluate aspects of ecosystem management including ecological integrity, ecosystem stability and aquatic system function (Reice and Wohlenberg 1993). The information on will be used to help inform the potential impacts of ramping rate considerations for the proposed Project.

OID Response:

OID agrees that information obtained from a macroinvertebrate study would be useful in the event best management practices fail to contain construction generated sediments. However, the project would not control reservoir release ramping rates and therefore the impacts of ramping should be a

consideration of dam and reservoir operations. The project would operate according to the releases made from the dam.

4.5 Proposed Methodology - §5.8(b)(6) — Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field seasons(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

ODFW Proposal:

Preferably the study would be done over a three year period prior to construction, however if necessary it could be scaled back to a two year study period.

Benthic invertebrate sampling is a critical component to evaluating habitat quality relative to fish productivity. Indices such as the proposed Hilsenhoff Biotic Index (Hilsenhoff 1988) have been successfully used because they incorporate a biological response to environmental conditions. Studies of benthic invertebrates have been used to evaluate aspects of ecosystem management including ecological integrity, ecosystem stability and aquatic system function (Reice and Wohlenberg 1993). This type of analysis is consistent with other fish protection analyses completed during licensing proceedings for hydroelectric projects that have the potential to adversely affect resident and anadromous salmonids and ESA-listed fish species.

OID Response:

ODFW does not identify any methodology it recommends. Therefore, OID proposes the following study methodology.

Macroinvertebrates will be sampled in the winter prior to construction within the ¼ mile reach below Bowman Dam. Within this area, approximately 9 samples will be collected as per ODEQ's request following the study completed by Symbiotics. Samples will be collected and preserved with ethanol in labeled containers. Identification of invertebrates will be to the genus level when possible. With these samples, evaluations will include biomass, density, Hilsenhoff Biotic Index, and EPT Index.

4.6 Level of Effort and Cost

ODFW Proposal:

The study would be done over a two year period prior to construction. The study is estimated to require two employees for a period of 15- 20 days on the field investigations. Two analysts would be expected to work for approximately 5 - 10 days on the analysis and report preparation. The total cost for conducting the analysis and preparing the report is estimated to be approximately \$20,000

OID Response:

The total cost of this study will be approximately \$30,000 to \$40,000 including equipment, data collection and processing, and report preparation.