

STUDY NO. 1: DETERMINE THE IMPACTS OF CONSTRUCTION OF HYDROELECTRIC FACILITIES AT ARTHUR R BOWMAN DAM ON REDBAND TROUT PRODUCTIVITY.

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

ODFW Statement:

The Crooked River below Bowman Dam is inhabited by a highly productive population of native Columbia basin redband trout (*Onchorynchus mykiss gairdneri*). This population supports a widely renowned fishery that contributes revenue to Prineville and Crook County. This study will help describe the effect of project operations on fish populations. ODFW will use this information to make recommendations as to whether the yet-to-be proposed mitigation will result in no net loss to fish populations. ODFW will also use this information to develop and implement strategies for fish management.

Construction of the project is anticipated to elevate sediment levels downstream from the project area. Impacts of sediment on salmonid spawning success are well documented. Fine sediment deposited in spawning gravel can reduce interstitial water flow, leading to depressed dissolved oxygen concentrations, and can physically trap emerging fry in the gravel (Meehan and Swanston 1977). In addition information on juvenile Redband Trout will help inform any ramping rate considerations.

An additional objective of the study would be to map areas of spawning gravels and assess their embeddedness. This would provide a baseline for monitoring actions associated with the proposed Project and potential provide avenues for mitigation.

OID Response:

It is OID's understanding that ODFW's goals and objectives of this study are to assess the baseline conditions of redband trout spawning habitat within the area likely to be effected by the project. The Crooked River Collaborative Water Security and Jobs Act of 2014 defines the potential area of project effect in Section 2(B)(i), "analyze any impacts to the scenic, recreational, and fishery resource values of the Crooked River from the center of Bowman Dam to a point 1/4 mile downstream that may be caused by the proposed hydropower development, including the future need to undertake routine and emergency repairs." The concern expressed by ODFW that forms the basis of the stated goals and objectives appears to be the potential for increased sedimentation caused by the project that may negatively impact redband trout spawning habitat. OID acknowledges that elevated suspended sediments can adversely affect fish populations by reducing spawning habitat quality. However, OID believes the objectives of this study should be to establish baseline sediment transport conditions within the affected area. This would better provide a means to estimate impacts from actions directly associated with the proposed project.

Additionally, OID believes it is important to consider the timing and location of project construction when evaluating proposed mitigation measures to prevent impact on downstream fish habitat.

- **When:** *Construction of the project is expected to occur during the winter which is when lowest flow typically occur. By constructing during the winter, it will be much easier to maintain required minimum flows in the Crooked River below Bowman Dam. Flows would be maintained*

either by pumping or siphoning water from Prineville Reservoir and discharging into or downstream of the Bowman Dam spillway.

- **Where:** *There will be at least three areas of construction: (1) The access road connecting the south abutment of the dam with the base of the dam near the spillway; (2) powerhouse and laydown/staging areas located at the end of the dam spillway and flat area at the base of the dam; and (3) internal to the dam for the installation of valves, piping, and powerhouse penstock.*
- **Mitigation:** *Best management practices would be implemented at all construction sites. Specific measures include: installation of silt fencing along the downside slope of the access road, sloping the road such that storm water runoff will be directed to the hillside of the road where sediment can be controlled with silt fencing, straw bales or directed to a sediment control pond before releasing to the river.*

Runoff from laydown and staging areas would be contained by constructing a berm around the site during the construction period. The surface of the laydown/staging area would be covered with clean gravel. Any runoff from the site would be channeled through a sedimentation pond before releasing to the river.

Construction internal to the dam may encounter a small amount of leakage from the reservoir and oil leaked from construction equipment may also be present. This would be contained in a holding tank where suspended solids and any oils would be removed before discharging to the river.

Sedimentation and runoff control systems would be monitored and inspected during storm events. If turbidity in the river reaches or exceeds acceptable limits established prior to project, construction of the project would cease until conditions return to acceptable limits.

A supply of spill containment and absorbent materials will be kept on site to be deployed to contain and clean up materials in the event of an oil or fuel spill.

1.2. 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 Statement:

Overriding resource goals and objectives are cited in the aforementioned OARs and ORSs. Specifically, the potentially affected area in the lower Crooked River is directed through OAR 635-500-1870 to be “managed for natural production consistent with the Wild Fish Management for trout (OAR 635-007-0525). This alternative states “the productive capacity of waters...will be maintained or enhanced so no net loss of natural fish production occurs. ODFW will actively pursue and promote habitat protection and enhancement.”

OID Response:

OID acknowledges and supports ODFW's management goals.

1.3 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 Statement:

The Crooked River below Bowman Dam is inhabited by a highly productive population of native Columbia basin redband trout (*Onchorynchus mykiss gairdneri*). Due to various anthropogenic factors depressing regional populations range wide, this subspecies is listed as both State sensitive and Federal candidate. The affected population is ecologically, socially and economically significant. The eight river miles below the dam represent a stronghold for redband trout. Favorable habitat and water conditions in this reach contrast with the degraded conditions in many other parts of the subbasin. Genetic analysis indicates Crooked River redband trout are unique from other sympatric redband trout (Currens, 1994). Population sampling conducted in 2000 estimated the trout population in this reach to be over 4,000 trout per mile (ODFW files, 2000).

ODFW conducted population estimates for Redband Trout in the Crooked River below Bowman dam in 1989, 1993-1995, 2001, 2003 and annually from 2006-2016. Population estimates for Mountain Whitefish were also conducted annually from 2007-2016. (Porter, T, and B. Hodgson. 2016)

However very little information is available on juvenile Redband Trout or Mountain Whitefish. This is an important data gap that is lacking in respect to informing potential impacts from the proposed hydroelectric project.

OID Response:

*OID acknowledges the importance of the Crooked River below Bowman Dam as a highly productive population of Columbia basin Redband Trout and Mountain Whitefish. However, in recent years, in addition to the surveys conducted by ODFW, additional studies examining Redband Trout populations below the dam have been completed. For example, Vaughan et al. (2013) surveyed juvenile Redband Trout in a 1.6 km study reach downstream of Bowman Dam and determined habitat associations and length distributions, which were used to predict age composition (Figure 1). In 2018, Mount Hood Environmental estimated baseline Redband Trout parr capacity to be 85,489 in the 8-mile section of the river below Bowman Dam (MHE 2018). Similarly, Blackman (2019) examined juvenile rearing capacities across various hydrologic conditions and estimated that the 14-miles of river below Bowman Dam could support between 35,290 – 111,809 juvenile *O. mykiss* during the winter and between 29,058 – 89,957 juveniles during the summer. Redband trout are reported to spawn from April till June in the Crooked River but have been seen spawning as early as February (Nesbit 2010) and are unlikely to be affected by construction.*

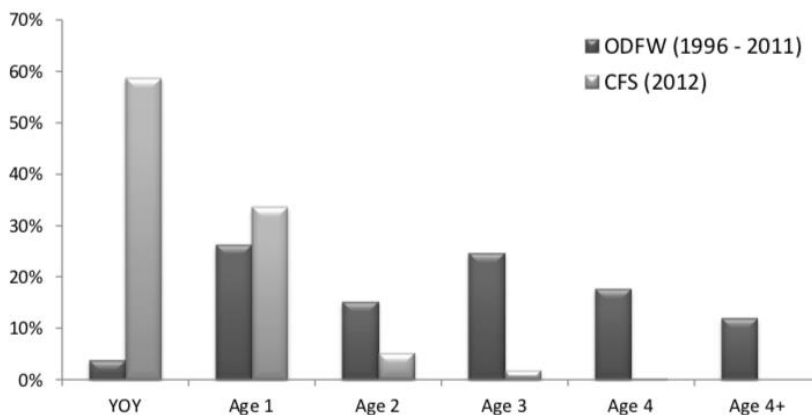


Figure 1. Predicted age composition of redband trout capture during annual ODFW boat electrofishing surveys, 1996-2011, and backpack electrofishing surveys, May and October 2012, downstream of Bowman Dam. Source: Vaughan et al. (2013)¹.

OID acknowledges that information specific to mountain whitefish is available, albeit limited as stated by ODFW. ODFW and the Crooked River Watershed Council (Stuart et al. 1996, Whitman 2002, Stuart et al. 2007) reported mountain whitefish to be abundant in the Crooked River below Bowman Dam. It is possible that the eggs of mountain whitefish will be affected by project construction given that whitefish spawn over gravel without making nests leaving their eggs exposed and sensitive to sedimentation and scour events. Whitefish spawning typically occurs in the late fall or early winter and juveniles hatch around March (Stuart et al. 1996) which may overlap with project construction.

1.4 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 Statement:

Construction of the project is anticipated to elevate sediment levels downstream from the project area. Impacts of sediment on salmonid spawning success are well documented. Fine sediment deposited in spawning gravel can reduce interstitial water flow, leading to depressed dissolved oxygen concentrations, and can physically trap emerging fry in the gravel (Meehan and Swanston 1977).

The data gathered from these studies is necessary to determine if activities associated with construction of hydroelectric facilities negatively impact the reproductive success of native redband trout. ODFW anticipates appropriate mitigation measures will be employed by OID if losses occur. ODFW will use this information to make recommendations as to whether the yet-to-be proposed mitigation will result in no net loss to fish populations.

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:

OID acknowledges that there is a degree of risk that project produced sediment could enter the Crooked River below Bowman Dam and will prepare a sediment control plan to prevent project produced sediments from entering the river. Similarly, OID proposes to monitor sedimentation levels while construction is occurring to prevent levels from exceeding detrimental amounts.

1.5. Proposed Methodology - §5.8(b)(6) — Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information,

¹ Vaughan, J., S. Duery, T. Kassler, and I. Courter. 2013. Crooked River Redband Trout Study. Cramer Fish Sciences. Gresham, Oregon. Report Prepared for Ochoco Irrigation District, Prineville, Oregon.

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 Statement:

The Applicant would monitor project impacts to redband trout productivity by conducting studies estimating numbers of age 0 trout and redds in the one-mile reach below the dam. This section addresses the “Crooked River tailwater age-0 redband trout study.” ODFW supports the basis for this study in evaluating project impacts, however, the proposed study protocol may not be successful at collecting the targeted data. This study should be conducted during the spring and fall of 2020 and 2021. While ODFW considers a two-year period for defining baseline conditions somewhat lacking, given the proposed FERC Traditional License Process (TLP), schedule a longer study period may not be possible. Still the study is necessary and valuable information for informing the impacts analysis. If time were to allow, a three year study is preferable. The effects of inter-annual variability in reproductive success could mask potential impacts from the project and thus a minimum of a three-year study period is therefore would be preferred prior to project construction. Sampling should be conducted during and after construction to evaluate impacts on age 0 redband trout. ODFW will need to procure a scientific taking permit from ODFW prior to engaging in this study (ORS 497.298).

Proposed methodology involve randomly selecting 20 shoreline transects each 15 meters long and three meters wide. Backpack electrofishing using three removal passes will be conducted to estimate abundance. ODFW recommends the 20 transects be landmarked using global positioning satellite coordinates. This would standardize inter-annual results and facilitate data analysis. The sampling design should employ accepted multiple pass removal estimation techniques including the use of block nets to isolate emigration and immigration from the sampling area during and between passes. Number of passes required to generate population estimates is dependent upon observed reduction in capture rate. A minimum of 67% reduction between passes is required to preclude additional passes (Seber and LeCren 1967; Nicholson et. al 1990). ODFW can work with OID to further refine the aspects of the study design.

OID Response:

It is not possible to conduct a baseline study longer than a single year due to the restricted timeline of the FERC Traditional License Process. Because of this, ODFW’s methods under the restricted timeline would not address the goals and objectives of the study to establish a baseline condition that can be used to assess the potential impact of project caused sedimentation on redband trout and mountain whitefish spawning. Additionally, ODFW has observed that populations of redband trout and mountain whitefish are highly variable from year to year, which ODFW has attributed to low flows and low temperatures during the winter in some years. As a result, estimating the numbers of age-0 trout and redds in one year would be inconclusive.

Furthermore, conditions below Bowman Dam are not conducive to successfully monitoring spawning redds. In the Crooked River, Redband Trout spawn between April and June, when flows are greatest and the river is highly turbid. Researchers in the basin have identified these conditions as problematic to observing redds (Burchell et al. 2016).

Alternatively, OID proposes to directly monitor turbidity and suspended solids within the first ¼ mile of the Crooked River below Bowman Dam to establish the baseline condition prior to construction.

The results of which would be presented in the Application for License submitted to the FERC. To monitor suspended sediment concentrations in real-time, a model will be developed using continuous turbidity data, measured total suspended solids (TSS), and discharge data. TSS will be monitored at two sites: below Bowman Dam and just upstream of Prineville Reservoir. A comparison of suspended solids concentrations between the two sample locations will help to determine the source of sediments transported through the potentially affected site and assess the impacts of the project. Baseline data collection will begin at least one year prior to construction and will continue through construction. Additionally, a literature review will be conducted prior to construction in order to determine a threshold for TSS that will adequately limit adverse effects to fish populations downstream. If during construction TSS exceeds this predetermined limit, OID will cease construction activities until corrective measures are implemented and suspended solid concentrations return to a level below the acceptable threshold.

1.6 Level of Cost and Effort - §5.9(b)(7) — Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

ODFW Statement:

OID will need to obtain a scientific taking permit from ODFW. In the best of conditions the study would be designed, permits obtained, and field studies initiated before the end of 2020. OID should begin the study in fall of 2020 and continue through the fall drawdown of the reservoir in 2021, with results reported by December of 2021 or if there are three years of data collected, by December of 2022.

The total cost for conducting the analysis and preparing the report is estimated to be approximately \$15,000. Two analysts would be expected to work for approximately 15 – 20 days on the collection of data. Additionally, two analysts would be expected to work for approximately 7-10 days preparing the draft report and final report.

OID Response:

To perform the study proposed by OID would cost approximately \$38,000 during the baseline year and \$32,000 during construction. A breakdown of approximate cost by field labor, equipment, analysis, and reporting is provided below.

<i>Study Period</i>	<i>Task</i>	<i>Cost</i>
<i>Baseline (Year-1)</i>	<i>Field Labor</i>	<i>\$15,000</i>
	<i>Analysis & Reporting</i>	<i>\$15,000</i>
	<i>Equipment</i>	<i>\$8,000</i>
<i>Construction (Year-2)</i>	<i>Field Labor</i>	<i>\$15,000</i>
	<i>Analysis & Reporting</i>	<i>\$15,000</i>
	<i>Equipment</i>	<i>\$2,000</i>
<i>Total</i>		<i>\$70,000</i>