

# CLACKAMAS RIVER HYDROELECTRIC PROJECT INSTREAM FLOW STUDIES

**PROJECT LOCATION:**  
Portland, Oregon

**CLIENT:**  
Portland General Electric

*Oak Grove Fork Clackamas River, Oregon*

**BACKGROUND:** Portland General Electric Company is relicensing the Clackamas River Hydroelectric Project through a FERC alternative licensing process that is based on collaborative involvement of all stakeholders.

The project is a multi-reservoir power generation facility located on the Clackamas River, a major tributary to the Willamette River, Oregon. The headwaters of the basin drain the high cascades slopes within the Mt. Hood National Forest while the river mouth is located in the urban setting of Portland Oregon.

Chinook and coho in the Clackamas River are listed as threatened and endangered. Other species addresses in aquatic studies include steelhead, cutthroat trout and macroinvertebrate populations.

**SCOPE:** EES Consulting worked collaboratively with PGE and the stakeholders to design and implement instream flow studies on the Clackamas River mainstem (mean annual flow 2,000 cfs) and the Oak Grove Fork (mean annual flow 500 cfs). EES Consulting conducted habitat studies including mesohabitat quantification and detailed spawning gravel mapping. Instream flow studies addressed appropriate flow rates and their temporal distribution as well as analyzing the effects of project peaking on mainstem salmonid and macroinvertebrate habitat. A collaborative effort employed multiple approaches for instream flow studies on the Oak Grove. 1-D RHABSIM analysis was compared to 2-D habitat modeling and the results of an expert habitat mapping approach to define flow – habitat relationships in the Oak Grove Fork and side channel



habitat. EES Consulting was responsible for design and field execution of studies, analytical modeling and report preparation. EES Consulting was also an active participant in collaborative meetings.

**WORK COMPLETED:** Application of instream flow and fisheries studies on this project involved:

- Habitat mapping and statistical analysis to determine the number, type, and distribution of study transects.
- Spawning gravel mapping to assess distribution, quality and availability of gravel relative to flow levels.
- Develop habitat suitability curves for each species/life stage of interest.
- Application of ADCP technology on high-gradient, remote river reaches of the Clackamas River and modeling instream flow habitat for a flow range from 300 cfs to 4,000 cfs.
- Analysis of project peaking effects through hydraulic modeling at 15 mainstem transects and 5 side channels.
- Member of expert habitat mapping team. Stakeholder biologists cooperatively quantified available habitat for each species/life stage by applying suitability criteria to visually delineate available habitat at multiple flows. Mapping was done on high-resolution overhead photos captured with a balloon mounted camera. Usable area curves as a function of flow were then generated.
- Conduct a 1-D RHABSIM modeling analysis and compare results to 2-D habitat modeling results.