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January 8, 2008

Dan Boettger
Director of Regulatory and Environmental Affairs
Okanogan Public Utility District
1331 Second Ave. N
PO Box 912
Okanogan WA 98840

RE: Studies to determine historical presence of anadromy above Similkameen Falls under Enloe Hydroelectric Project, P-12569

Dear Mr. Boettger,

My name is Virginia Butler. I have a Ph.D in interdisciplinary studies (paleoichthyology), with special expertise in historic fish ranges. Currently I am a professor in the Department of Anthropology at Portland State University, where I am conducting research on long-term interactions between people and fish in the Columbia River system, Puget Sound, and wetlands of eastern Oregon, as these can be documented using archaeological fish remains. Last year, I conversed by telephone with your predecessor Larry Felton to discuss the potential for prehistoric fish in the Similkameen system and am following up with a letter to you and your office.

In reviewing the record for the current Enloe hydroelectric licensing proceeding, I am concerned that the Okanogan Public Utility District (PUD) has not given proper attention to the question of passage above Enloe Dam. Specifically, no technical evidence exists to ascertain whether salmon and steelhead (*Oncorhynchus* spp.) were able to ascend past Similkameen Falls before the construction of Enloe Dam. As the PUD is aware, access to the currently blocked portion of the Similkameen system offers significant potential biological value to these species.

To answer the question of historic access, there are two scientific approaches the PUD might take, which I outline more specifically below: study the archaeological record of animal remains, particularly fish bone, from sites along the river and Palmer Lake, and examine the geochemistry of Palmer lake sediments. If appropriate, this information can be reformatted to meet the Federal Energy Regulatory Commission's requirements for additional study requests (18 CFR 5.9 (b) (1)-(7)).

I. Archaeological Fish Record

Animal bones and teeth from archaeological sites provide an important record of past animal distributions that is increasingly used to address contemporary fish and wildlife management issues (Lyman and Cannon 2004). Past humans, through hunting and gathering activities, left residues of the animals they relied on in villages and seasonal camps. Often these places were occupied for hundreds to thousands of years, providing a long sequence of animal bone deposits. For the past ~40 years, the field of zooarchaeology (study of animal remains from archaeological sites) has developed a series of protocols and methods that have enabled detailed reconstructions of past animal distributions and abundances (Lyman 1996; Butler and Campbell 2004).

Using salmon and steelhead trout remains as a measure of past fish distribution is based on the following rationale: salmon and steelhead trout were highly favored foods of Plateau peoples (e.g., Ray 1932; Hewes 1998). If the fish were present in a region, they would be captured and in turn, their remains would be deposited in archaeological sites. This claim is supported by Butler and Campbell's study of fish remains from Columbia Plateau archaeological sites: 90% of the archaeological sites located adjacent to historically known salmon migration corridors contain salmon bones (Butler and Campbell 2004).

The archaeological record in the Similkameen River system is well-suited to address the question of whether the Falls blocked fish movement in the past. Salo (1987) carried out a preliminary review of Similkameen Valley cultural resources and documented 46 cultural resource sites. While testing was limited, his work suggested the likelihood for stratified sites and recovery of fish remains. He specifically noted the value of using the archaeo-fish record to evaluate whether the Similkameen above Enloe Dam supported salmon populations (Salo 1987:52).

While animal bone records from archaeology can be extremely valuable for reconstructing past animal distributions, several issues need to be considered in interpreting bone records.

A. Human transport of fish.

People may have caught fish below the falls or on the Okanogan River proper and only transported animal carcasses or parts to the Similkameen River above the Falls. If this occurred, then the presence of fish remains in sites above the Falls would not mean that salmon and steelhead ascended the falls, only that their skeletons were deposited in these areas. This confounding factor can be addressed by examining the range of skeletal parts represented across multiple sites. Given salmon (especially chinook) and steelhead trout's large size, when transporting fish, only parts of the body would be moved. Thus, the presence of all parts of the skeleton in Similkameen sites would indicate local capture.

B. Preservation.

Bone preservation depends on a complex set of interacting variables including condition when buried, speed of burial, and soil acidity and porosity (Lyman 1994). While specific preservation conditions in the Similkameen drainage are not known, buried remains have been recovered from nearby locations (near Oroville- Chatters et al. 1987) and in multiple archaeological sites along the Columbia River upriver of Chief Joseph Dam (Butler and Campbell 2004). Thus the archaeological record in the Similkameen drainage is likely to have good preservation conditions. Even if the bone has become degraded, small fragments should be preserved and would be recovered if fine-screen sampling was used. If remains are too fragmentary to allow

for species diagnosis using bone morphology, it would be possible to extract ancient DNA from the remains (e.g., Butler and Bowers 1998).

C. Sampling.

Recovery of animal remains requires excavation of buried sediments. Comparative study of sites from nearby project areas and identification of likely site contexts and features (house pits, storage pits) would be needed to develop a sample plan and set sample intensity (e.g., amount of excavated volume needed to establish the presence of the fish, Lyman 1995). In terms of observation and collection in the field, the skeletal elements of salmon and steelhead trout are relatively large and should be recovered using large mesh screens (6.4 mm, ¼" mesh) that are commonly used during archaeological investigation (Butler 1993). If fish processing or other activities have caused the bone to break down, smaller fragments would be identified in finer mesh screens (3.2 mm, 1/8" mesh; 1.6 mm, 1/16" mesh).

D. Previous Archaeological Excavation on the Similkameen River.

Copp summarizes recent excavation projects on the Similkameen in Canada (2006); salmonid remains were not recovered. Elder (2007) argues on several counts that the absence of salmon remains in Copp's study should not be taken as evidence that salmon were not present. The total volume excavated was small relative to other projects with salmon bone, such as from the Columbia River upriver from Chief Joseph Dam (Butler and Campbell 2004). Copp's study sites were mainly located on side streams, not the Similkameen proper, suggesting the site locations were not fishing areas, but more likely hunting camps. Also, bone preservation appeared to be very poor, reducing the likelihood of recovering bone from any creature, much less salmon. Thus Copp's work does not constitute an adequate test for the historic distribution of salmonids in the Similkameen.

Recent archaeological study in the area to be affected by the Enloe Dam Hydro project was carried out by ENTRIX, Inc, in consultation with the Cultural Resources Work Group (Okanogan County, Exhibit E.4). Only limited archaeological excavation occurred as part of this work, which was designed to assess impacts to cultural resources in general, rather than consider the past record for fish. Thus this recent work was not adequate to address questions of ancient salmon in the river system.

II. Geochemistry of Lake Sediments

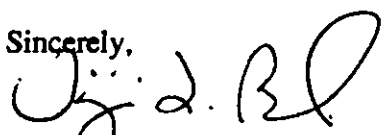
A number of recent studies in southern Alaska (Finney et al. 2000; 2002) and Idaho (Selbie et al. 2007) have established the value of using paleolimnology to reconstruct past salmon abundance and distribution. Briefly, this work relies on the fact that salmon returning to freshwater habitats represent a significant output of marine-derived nutrients that have a distinctive geochemical signal (e.g., enriched Nitrogen-15). This approach is especially useful for studying history of sockeye salmon (*O. nerka*) which rely on lakes as part of their spawning life cycle. Spent, decaying carcasses become incorporated into stratified lake deposits that accumulate as part of natural lake processes. Cores obtained from lake bottoms have provided clear records of past sockeye salmon abundance from the historic era to ~2200 years ago (Finney et al. 2002).

It should be possible to assess whether Palmer Lake at one time supported sockeye salmon populations by coring the lake and conducting analysis of bottom sediments. Kokanee (a land-locked form of sockeye salmon) reside in Palmer Lake today; there was apparently a historic introduction of these fish to the lake in the 20th century. A lake coring study would allow detection of a pre-19th century record of sockeye salmon. Recent lake cores obtained by Bruce Finney and his team in nearby Lake Okanagan and Lake Osoyoos, lakes known to support sockeye salmon, would provide control samples for interpreting geochemistry signals in Palmer Lake (B. Finney, personal communication, June, 2007). Stream bottom sediments (from the Similkameen River channel for example) would not be amenable to this type of study, given the lack of continuous deposition in the more dynamic stream system. Other lakes in the Similkameen system may provide even better sampling sites appropriate for coring and geochemical analyses (Jesse Ford, Oregon State Univ. pers. comm.).

I strongly recommend that archaeological sampling for fish remains and geochemical testing of lake sediments be undertaken, given the importance of the question of past salmon and steelhead trout distribution and the benefits of relying on multiple independent lines of evidence in establishing scientific understanding. Neither approach will provide comprehensive and certain outcomes. For example, if archaeological sites lack bones entirely, then the absence of fish in particular could not be linked to past fish distribution, but rather reflect a lack of preservation. On the other hand, if multiple archaeological sites contain mammal bones (e.g., deer, marmot) but lack fish, the PUD would have a basis for arguing that salmon and steelhead did not migrate above the Falls prior to the 19th century. Alternatively, if multiple sites contain salmon or steelhead trout, then the evidence points to pre-19th century migration of fish above the Falls. The lake core study will evaluate whether sockeye salmon populations utilized the Similkameen and not assess whether other species ascended the Falls.

This letter outlines two approaches the PUD should take to evaluate the key question: did salmon and steelhead trout historically ascend Similkameen Falls? These study outlines are presented from a scientist with specific knowledge of the kinds of studies that are needed to address this question. If the PUD would like me to develop a more detailed proposal and budget or set up project guidelines for other scientists to pursue, I would be happy to work with the PUD in such a way. Please contact me at your earliest convenience to discuss undertaking these identified study approaches.

Sincerely,



Virginia L. Butler

cc:
Bose, Federal Energy Regulatory Commission
Heinith, Columbia River Inter-Tribal Fish Commission
Kirkendall, National Marine Fisheries Service
Swift, American Rivers
Morgan, Upper Columbia Salmon Recovery Board
Bowers, Hydropower Reform Coalition

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