



Your Northwest renewables utility

November 19, 2012

**VIA ELECTRONIC FILING**

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission (FERC)  
888 First Street NE  
Washington, DC 20426

**Re: Jackson Hydroelectric Project, FERC No. P-2157  
Spada Lake Reservoir 2012 Gill Net Survey Technical Memorandum  
License Article 409**

Dear Secretary Bose:

Enclosed is the Public Utility District No. 1 of Snohomish County's Spada Lake Reservoir 2012 Gill Net Survey Technical Memorandum per License Article 409 [item (3)] for the Jackson Hydroelectric Project. The technical memo was provided to the Washington Department of Fish and Wildlife on November 15, 2012.

If you have any questions on the enclosed technical memorandum, please contact Keith Binkley, Natural Resources Manager, at (425) 783-1769 or [KMBinkley@snopud.com](mailto:KMBinkley@snopud.com).

Sincerely,

A handwritten signature in blue ink, appearing to read "Kim D. Moore".

Kim D. Moore, P.E.  
Assistant General Manager of Generation, Water, and Corporate Services  
[KDMoore@snopud.com](mailto:KDMoore@snopud.com)  
(425) 783-8606

Enclosed: Spada Lake Reservoir 2012 Gill Net Survey Technical Memorandum

# TECHNICAL MEMORANDUM

---

**Date:** November 15, 2012  
**From:** Keith Binkley, Natural Resources Manager  
**Re:** Jackson Project (P-2157), Spada Lake Reservoir Gill Net Survey (October 2012)

---

Per Article 409 of the Jackson Hydroelectric Project's (Project) License, the Spada Lake Recreational Fishery Plan (SLRF Plan) requires the Public Utility District No. 1 of Snohomish County (District) to conduct gill net surveys in Spada Lake Reservoir (SLR) once every 5 years during the month of October, beginning in 2012. The surveys are to be patterned after past surveys conducted by the Washington Department of Fish and Wildlife and the District in 1997 and the District in 2007. The SLRF Plan further stipulates that an emphasis will be placed on monitoring the trout population; however, data on the bullhead population and other species encountered during the sampling effort are collected as well. Data analyses are to include an assessment of species composition, catch per unit effort (by species), size structure, and condition factor. Upon completion, a technical memorandum is to be prepared including comparisons with previous survey efforts. This technical memorandum describes the results of the 2012 gill net survey.

## **Results**

The 2012 survey was conducted during the first week of October 2012 following the same methods (gear type and net set location zones) used by Pfeifer et al. (1999) and Meridian Environmental and Shuksan Fisheries Consulting (2008). Tables 1 and 2 and Figures 1 through 4 summarize the results of this survey effort and are presented below addressing the categories stipulated in the SLRF Plan (District 2010). For the purpose of this technical memorandum, "trout" represents the total of all rainbow, cutthroat, and potential hybrids of these two species.

**Table 1. Species Composition (% of total fish captured), Spada Lake Reservoir.**

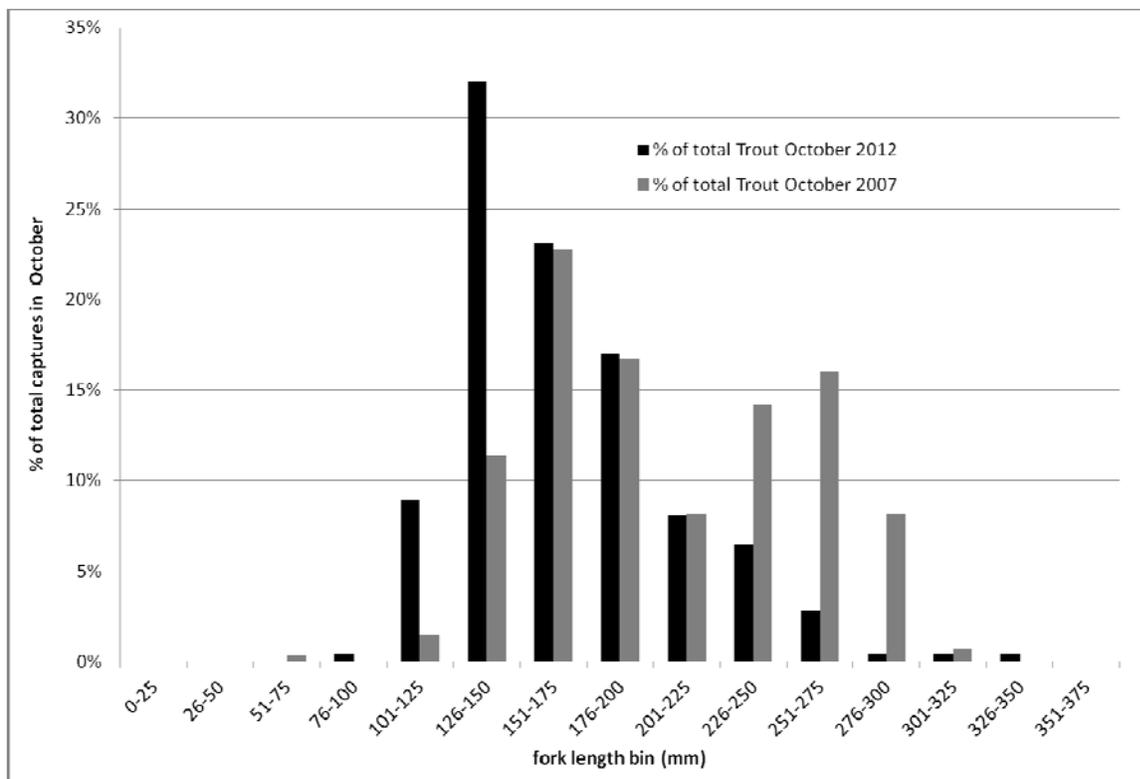
<b>Survey</b>	<b>Trout</b>	<b>Bullhead</b>	<b>Sucker</b>
2012 October	31%	35%	35%
2007 October	50%	48%	2%
2007 All Months	32%	67%	1%
1997 All Months	51%	49%	0%

**Table 2. Catch Per Unit Effort (CPUE), by species, Spada Lake Reservoir.**

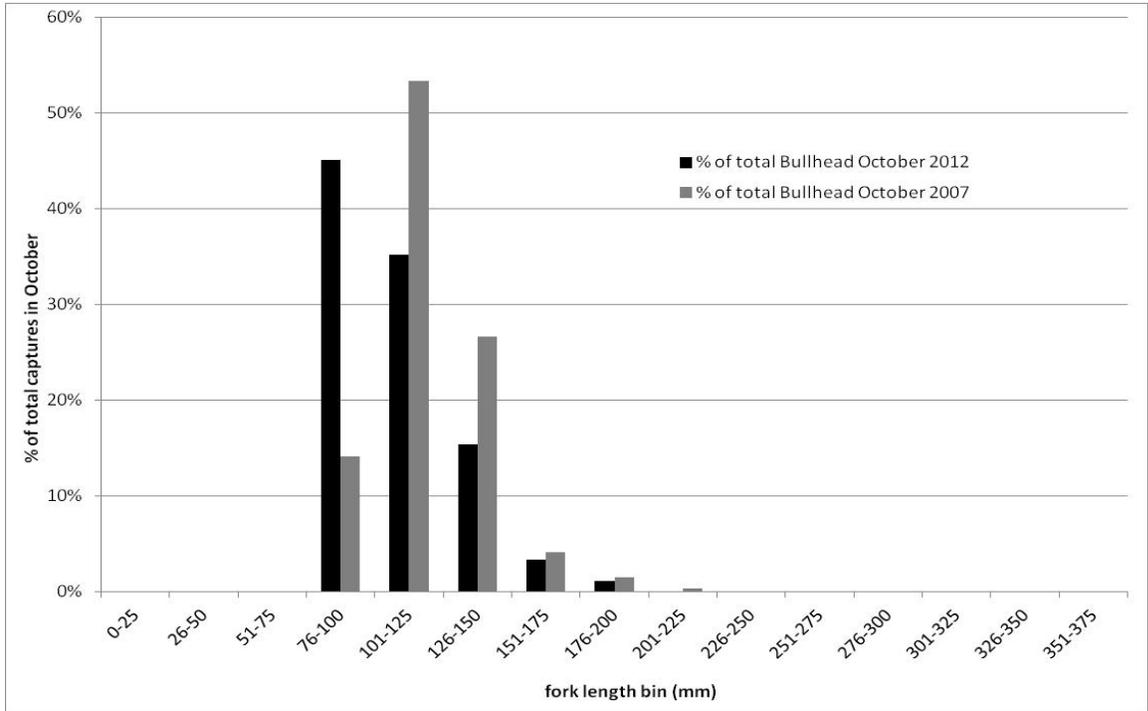
Survey	CPUE (fish/hour)		
	Trout	Bullhead	Sucker
2012 October	1.25	1.40	1.40
2007 October	0.70	0.66	0.03
2007 All Months	0.44	0.93	0.01
1997 All Months	0.35	0.34	0.00

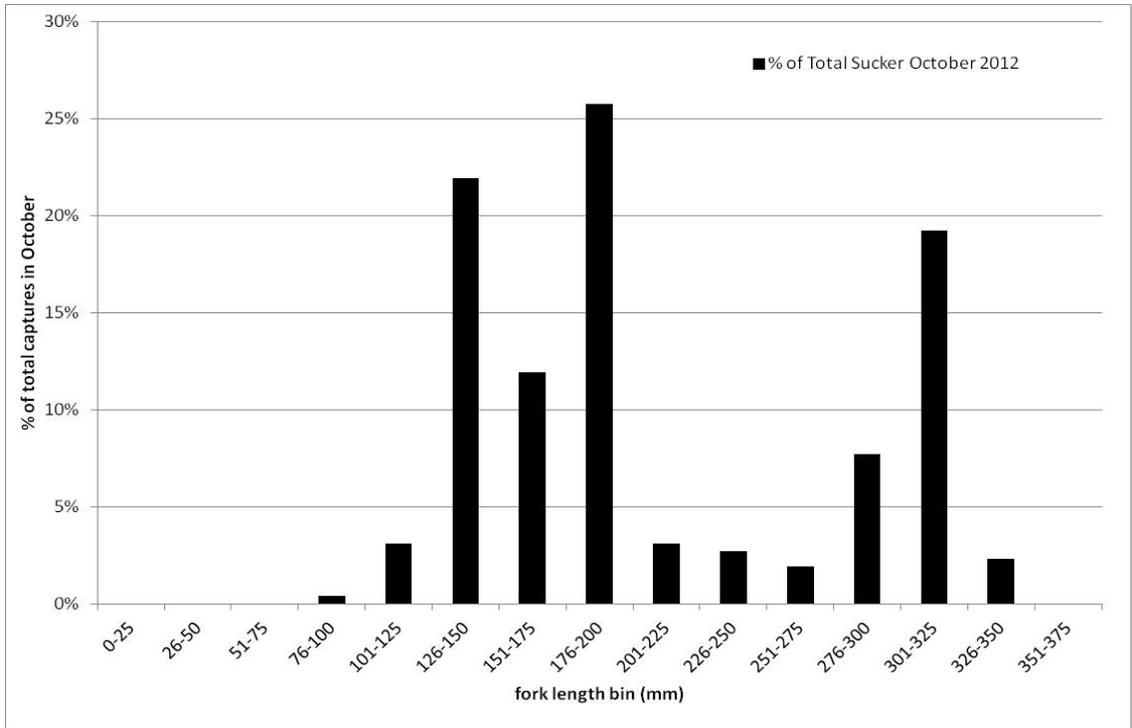
Survey	Biomass/Unit Effort (grams/hour)		
	Trout	Bullhead	Sucker
October 2012	81.0	22.4	149.0
October 2007	58.5	13.2	4.3



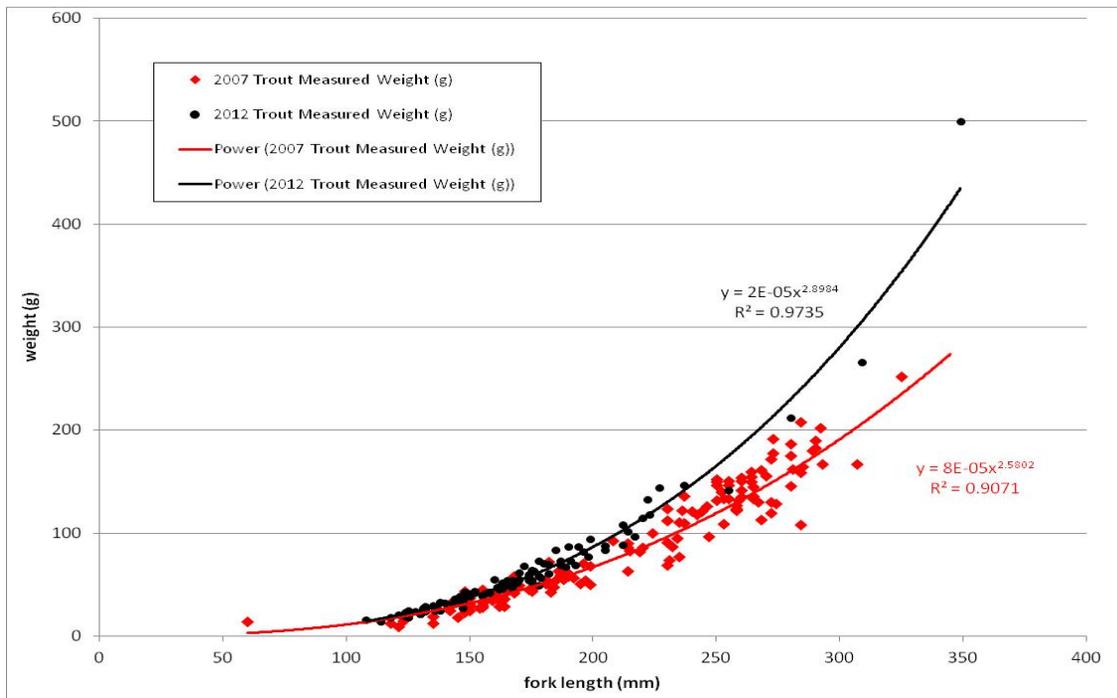
**Figure 1. Length Frequency Distribution of trout captured in Spada Lake Reservoir during 2007 and 2012.**



**Figure 2. Length Frequency Distribution of brown bullhead captured in Spada Lake Reservoir during 2007 and 2012.**



**Figure 3. Length Frequency Distribution of large-scale suckers captured in Spada Lake Reservoir during 2012.**



**Figure 4. Length:Weight Relationship of trout captured in Spada Lake Reservoir during 2007 and 2012.**

## **Discussion**

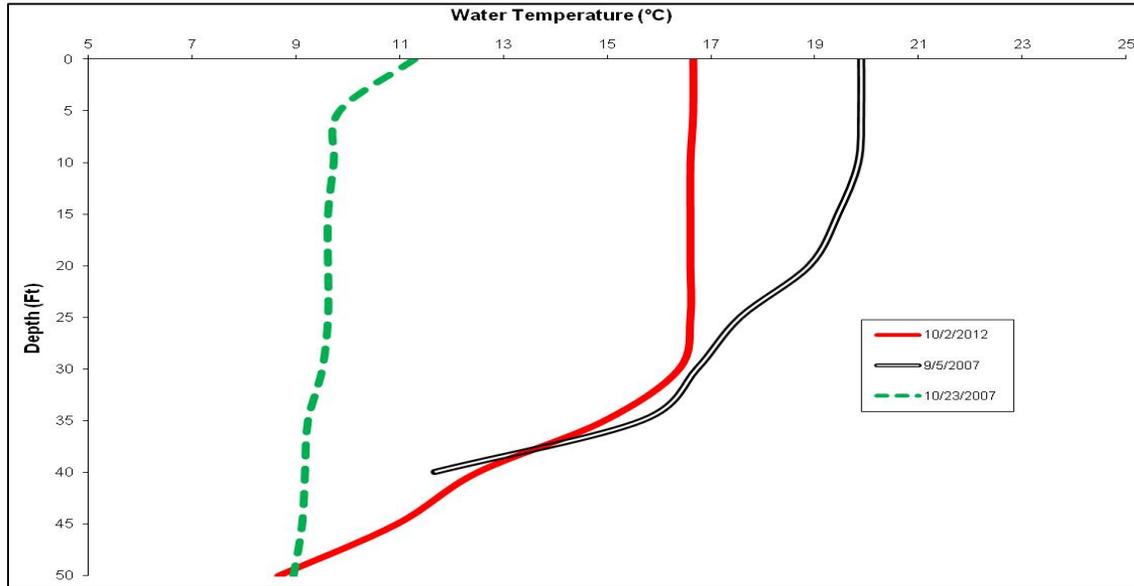
The 2012 gill net survey results clearly demonstrate a dramatic increase in large-scale sucker abundance and biomass compared to what was observed in 1997 and 2007 (Table 1, Table 2, Figure 3). Large-scale suckers were not captured in 1997 during several months of sampling. In 2007, similar low numbers (less than 30 total) of suckers were captured during several months of sampling. By comparison, in 2012, over 200 suckers were captured during a single sample trip.

The results of the 2012 survey also suggest that the length size class distribution has shifted to smaller fish (Figure 1, Figure 2). This shift is a possible consequence of increased competition with large-scale sucker. However, the condition factor of these captured trout appears to be higher (i.e., greater mass/length) than what was observed during previous surveys, as demonstrated by the length:weight relationship (Figure 4).

The 2012 results also indicate that trout and bullhead maybe more numerous than in 2007 as demonstrated by an increase in CPUE for each species (Table 2). However, environmental conditions were different during the October 2012 survey compared to conditions in October 2007 (Table 3, Figure 5). Water temperature, secchi depth, and lake level elevation were all substantially different between these sample periods and may have influenced fish catchability.

**Table 3. Lake Level and Secchi Depth, Spada Lake, 2007 and 2012**

	October 2007	October 2012
Lake Level Elevation (ft msl)	1,431	1,413
Secchi Depth (ft)	4.0	16.0



**Figure 5. Profiles of reservoir water temperature, 2007 and 2012.**

Further analysis suggests that differing reservoir levels may explain the large increase in trout CPUE observed between 2007 and 2012. We hypothesize that, with the assumption of a fixed trout population size and consistent sampling methodology, a higher CPUE would result as lake level decreases. This may be a result of trout becoming more concentrated due to decreased water volume as well as a higher sample rate (more gear per water volume). Linear regression of gill net sets from 2007 with similar diel and spatial sampling coverage as 2012 sets confirm this hypothesis maybe true, as a strong negative relationship between Spada Lake Reservoir level and trout CPUE exists,  $R^2=0.81$  (Figure 6). The linear regression equation based on the 2007 data predicts a trout CPUE of 1.01 trout/hour at lake elevation 1,413 feet msl. The actual 2012 trout CPUE at lake elevation 1,413 feet msl was 1.25 trout/hour. Furthermore, adding the October 2012 sampling event to the regression analysis results in a very strong negative linear relationship between lake level and trout CPUE,  $R^2=0.93$  (Figure 7). Overall these data suggest that trout abundance may have somewhat increased, although not as dramatically as suggested by pure comparison of CPUE alone.

A similar relationship between lake level and bullhead exists, but is confounded by one data point during the highest bullhead CPUE, which was heavily skewed high by a few very high individual bullhead catches in shallow warm water net sets occurring in July 2007.

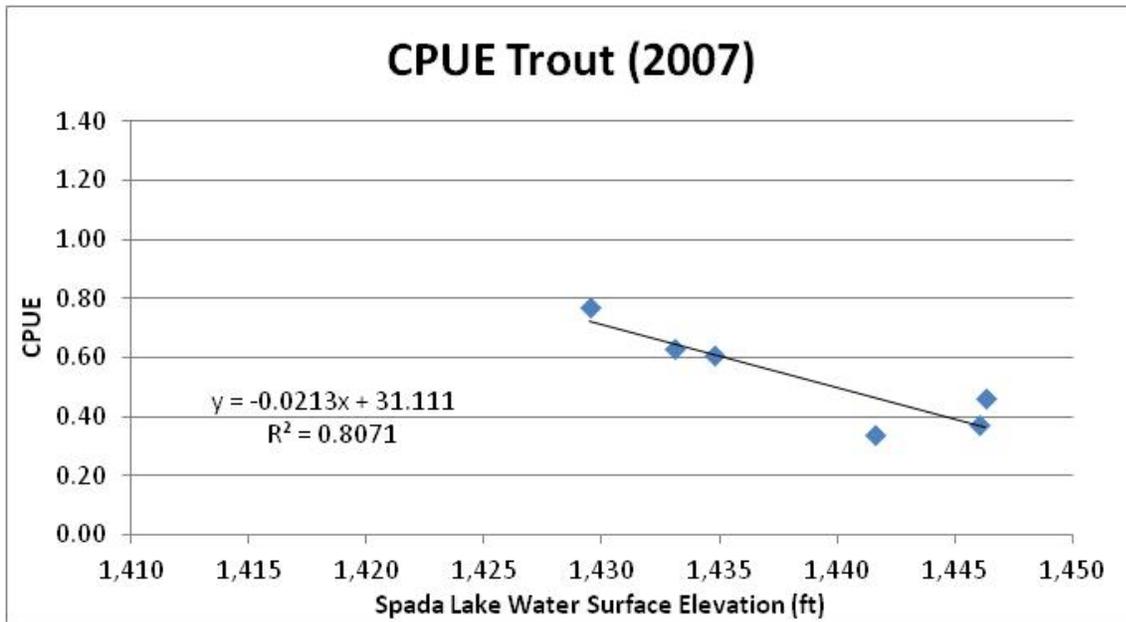


Figure 6. Lake level and CPUE effort regression (2007).

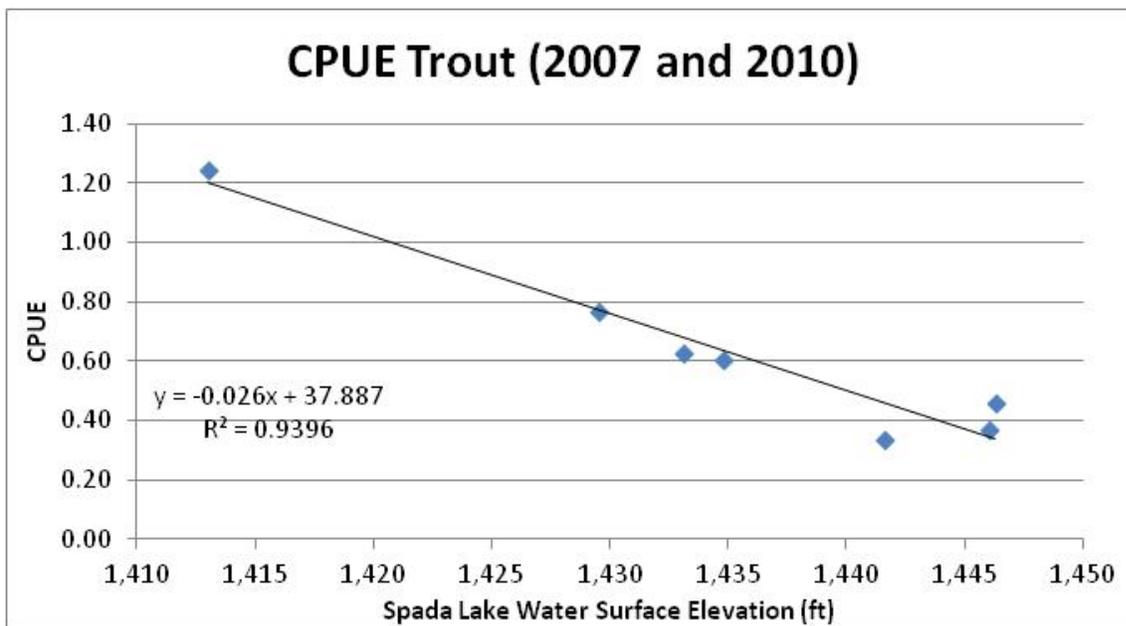


Figure 7. Lake level and CPUE effort regression (2007 and 2010).

## References

Meridian Environmental, Inc. and Shuksan Fisheries Consulting, LLC. 2008. Henry M. Jackson Hydroelectric Project (FERC 2157) Relicensing, Revised Study Plan 16 Spada Lake Trout Production Draft Phase 2 Field Studies Technical Report, dated February 8, 2008.

Pfeifer, B., P. Tappel, A. Vogel, M. Schuh, and W. Brunson. 1999. Spada Lake Biological Assessment and Sport Fishery Evaluation. Washington Department of Fish and Wildlife, Fish Program, Fish Management Division. December, 1999.

Public Utility District No. 1 of Snohomish County (District). 2010. Spada Lake Recreational Fishery Plan Henry M. Jackson Hydroelectric Project (FERC No. 2157), dated July 2010.