

**WELLS PROJECT SUBYEARLING CHINOOK LIFE HISTORY STUDY
YEAR 3**

WELLS HYDROELECTRIC PROJECT

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1.0 INTRODUCTION

A paucity of information exists on subyearling Chinook salmon (*Oncorhynchus tshawytscha*) migration size and the diversities of life histories supported by the Well Project. To address this information gap, Public Utility District No. 1 of Douglas County (Douglas PUD) began a multi-year study in 2011 aimed at describing the behavior and life-history strategies of subyearlings in the Wells Project. The study was repeated in 2012, and over those two years, in excess of 30,000 subyearling Chinook were tagged and released above Wells Dam. Approximately 6-9 percent of those fish were subsequently detected at Rocky Reach Dam. During the first two years, tagged fish continued to pass Rocky Reach throughout the month of August, indicating a population with a protracted outmigration, the timing of which is difficult to predict for an individual tagged fish. In 2011, Douglas PUD staff identified a critical length threshold beyond which migration was more predictable and rapid than for smaller fish. In 2012 larger fish migrated much faster than smaller conspecifics; however, the population of fish did not exhibit the marked change in migration behavior at a distinct size threshold as observed in 2011, suggesting annual variation in those factors influencing migration behavior. Study results from 2011-2013 should provide context for managers in the mid-Columbia concerned with addressing biases and unknowns regarding subyearling life history in the Mid-Columbia. In addition, results should assist researchers in defining a subyearling “migrant,” in terms of size and timing.

In 2013 Douglas PUD proposes to repeat study efforts that proved effective in 2011 and 2012. The following section (“Methodology”) describes the details of study implementation and analysis for 2013. Background information, hypotheses, and findings to-date are thoroughly described, respectively, in the study plan for 2011 (Gingerich et al. 2011), and the 2011 study report (Gingerich et al. 2012) and 2012 technical memo comparing 2011 and 2012 results (Gingerich et al. 2013).

Key changes to the 2013 study plan relative to previous years include extending the tagging period to four weeks instead of the three-week period that was used in 2011 and 2012. The four-week tagging schedule will allow Douglas PUD to tag fish over a greater portion of the run and minimize high recapture rates observed in 2012. In addition to extending the tagging period Douglas PUD will install small-mesh flooring on the bottom of the net pens to retain shed tags within the net pens. Prior to release of tagged fish, tagging staff will run a magnet over the net-pen floor to recover shed tags. Enumeration of shed tags will allow the estimation of tag-shed rates.

2.0 METHODOLOGY

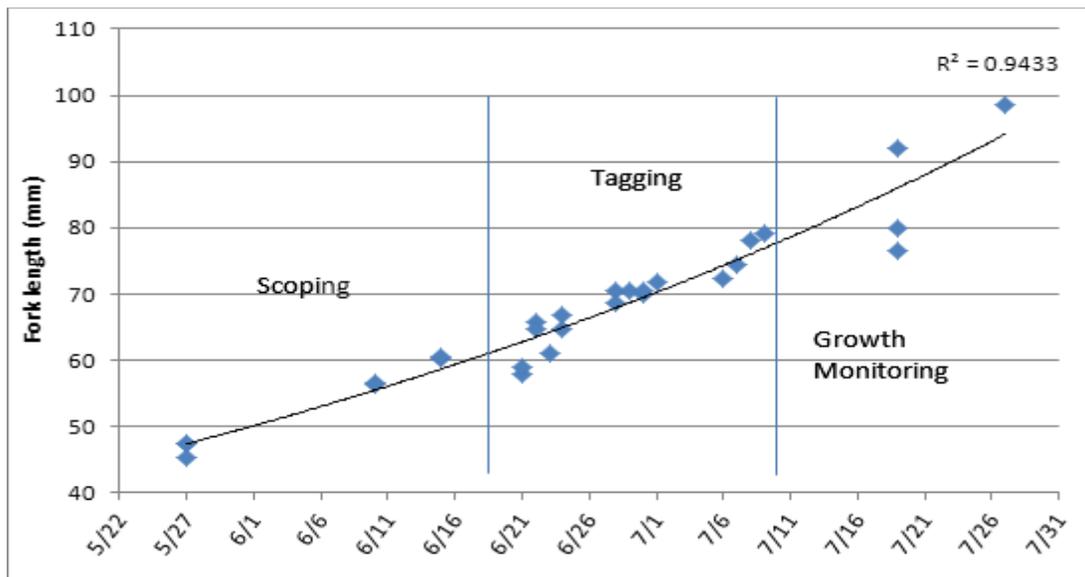
All fish used in this study will be captured using beach seines in the Wells Project above the dam as described in the 2013 technical memorandum comparing 2011 and 2012 results (Gingerich et al. 2013). Seining locations will be selected based on observational knowledge of localized aggregations of subyearling Chinook gained from the first two study years, and perhaps new sites identified during scoping activity prior to tagging in 2013. Specific locations include: 1) Gebber’s Landing on the north shore of the Wells Project near the confluence of the Okanogan

and Columbia Rivers; 2) Wells Forebay on river left about one mile upstream of Wells Dam; and 3) Washburn Island, upstream from the Okanogan confluence.

2.1 Proposed Seining Dates

Specific sample dates will be based on pre-tagging sampling efforts (“scoping”) throughout the Wells Project in May and June of 2013. Tagging will begin when sufficient fish are available and mean fork length is predicted to be 70 mm, which will probably fall on the last week of June or first week of July in 2013 (Figure 1). Once Douglas PUD determines that the fish are of sufficient size, seining to collect fish for tagging will begin and continue for up to four weeks. Seining will occur on 3 days a week (Monday-Wednesday), and tagging days will follow each seining day (i.e., Tuesday-Thursday). Refer to Table 1 for predicted dates of collection and tagging. Douglas PUD and the contractor will target tagging 20,000 fish (based on availability). Once tagging targets are achieved, seining in support of tagging will cease, and weekly sampling for fish presence and size will continue until fish are no longer available in nearshore areas.

Figure 1. Mean sizes of subyearlings captured in the Well Project in 2011 as an example of the anticipated relationship between fish sizes and date that Douglas PUD will use to determine when tagging can commence in 2013. Vertical lines delineate the tagging period from scoping and growth monitoring efforts.



2.2 Capture Details

Similar to 2011 and 2012 methods, two 100-foot-long by 10-foot-deep beach seines will be used by one or two collection crews. Nets will be fixed to the bow of a boat and panned out perpendicular to the shore. Concurrently, staff on shore will begin walking up the shoreline against the current. Once the net is extended the boat will move in reverse and parallel to the shoreline matching the pace of the shoreline crew. After approximately 100 m of shoreline is

covered the boat will close the loop by beaching onshore. The net will be drawn in and the content evaluated. Non-target fishes that are captured will be enumerated (estimate), identified to species, and released.

<u>Date</u>	<u>Day</u>	<u>Activity</u>			Collection Goal	Tagging Goal	% Taggable
21-Jun-13	Friday	Last day of Size scoping					
22-Jun-13	Saturday						
23-Jun-13	Sunday						
24-Jun-13	Monday	Collection			2000	1000	50%
25-Jun-13	Tuesday	Collection	Tagging		2000	1000	50%
26-Jun-13	Wednesday	Collection	Tagging	Release (Contractor)	2000	1200	60%
27-Jun-13	Thursday		Tagging	Release (Contractor)			
28-Jun-13	Friday			Release (Douglas PUD)			
29-Jun-13	Saturday				Subtotal	6000	3200
30-Jun-13	Sunday						
1-Jul-13	Monday	Collection			3000	2250	75%
2-Jul-13	Tuesday	Collection	Tagging		3000	2250	75%
3-Jul-13	Wednesday	Collection	Tagging	Release (Contractor)	3000	2400	80%
4-Jul-13	Thursday		Tagging	Release (Contractor)			
5-Jul-13	Friday			Release (Douglas PUD)			
6-Jul-13	Saturday				Subtotal	9000	6900
7-Jul-13	Sunday						
8-Jul-13	Monday	Collection			3000	2550	85%
9-Jul-13	Tuesday	Collection	Tagging		3000	2550	85%
10-Jul-13	Wednesday	Collection	Tagging	Release (Contractor)	3000	2700	90%
11-Jul-13	Thursday		Tagging	Release (Contractor)			
12-Jul-13	Friday			Release (Douglas PUD)			
13-Jul-13	Saturday				Subtotal	9000	7800
14-Jul-13	Sunday						
15-Jul-13	Monday	Collection			1500	1485	99%
16-Jul-13	Tuesday	Collection	Tagging		1000	990	99%
17-Jul-13	Wednesday	Collection	Tagging	Release (Contractor)	500	495	99%
18-Jul-13	Thursday		Tagging	Release (Contractor)			
19-Jul-13	Friday			Release (Douglas PUD)			
20-Jul-13	Saturday				Subtotal	3000	2970
21-Jul-13	Sunday				Total	27000	20870
22-Jul-13	Monday	Contingent week					
23-Jul-13	Tuesday						
24-Jul-13	Wednesday						
25-Jul-13	Thursday						
26-Jul-13	Friday						
27-Jul-13	Saturday						

Table 1. Predicted 2013 collection, tagging, and release dates and target tagging numbers.

2.3 Tagging Procedures

All juvenile subyearling Chinook retained for tagging will be held in net pens in the river or in containers supplied with ambient, oxygenated river water. Captured subyearlings will be given 12+ hours to recover from netting stress, prior to being anesthetized and PIT tagged, and following tagging will be held overnight prior to release back into the capture location the next morning.

Tagging methods will be identical to 2011 and 2012 efforts and closely mimic those found in Bickford et al. (2011). Briefly, fish will be anesthetized using MS-222 following methods outlined in Summerfelt and Smith (1990). Once anesthetized, fish will be injected with a 12.5 mm PIT tag (0.1g in air). Cross contamination will be prevented by using one needle per fish. During tagging, fish will be measured (fork length) and a subset (first 20) will be weighed. General observations about fish health, descaling and condition will also be noted following methods found in Bickford et al. (2011). Unhealthy fish (signs of Bacterial Kidney Disease [BKD], deformities, and descaling > 40 percent) will not be tagged. Data on tagged fish will also be appended to tagger initials. All PIT-tagging information will be uploaded to PTAGIS database and Columbia River DART. All PIT tagging will be performed by Biomark employees. Software to record data such as location, fish length, health, water temperature, time of day, etc. will be provided by Biomark.

In 2013 all fish will be evaluated by taggers including bycatch. Fish will be identified by species, and lengths taken on all subyearling Chinook. Lengths will be taken on the first 25 non-target taxa of each species and the rest will be counted. Only subyearling Chinook of taggable size (60 mm or larger) will be PIT tagged. Bycatch will be released after being identified and measured.

2.4 Statistical Analyses

Analyses of growth, run timing, distribution of passage and all additional statistical methods will be performed in JMP 7.0 (SAS) and MS excel. Statistical significance will be assessed to $\alpha = 0.05$. All mean values will be reported with standard deviation where appropriate. Linear regression models will be used to assess growth and migration timing. Mean growth rates and travel times will be compared using 1-way analyses of variance. Nonparametric equivalents including Kruskal-Wallis and Mann-Whitney U may be used when sample sizes are not equal or sample sizes are too low. Transformations will be used where data appear to be non-normal or variances are unequal in order to employ parametric analyses. Principal Component Analysis (PCA) or other models may be used to identify numeric and continuous variables that predict migration timing or travel time. In addition PCA may be used to determine the factors that contribute to the probability that a fish will be detected post tagging. Specific statistical tests will be reported in the final report, which will be prepared in 2014 and distributed to the Wells Habitat Conservation Plan (HCP) Coordinating Committee.

2.5 Reporting

Similarly to 2011 and 2012 the contractor will furnish Douglas PUD with a brief tagging report. This tagging report should focus on 2013 tagging result but also include section in the report that are comprehensive three year comparisons (2011-2013) with comparable figures, tables and analyses. Douglas PUD staff will compile this information with PTAGIS and life history analyses described as in the 2011 report (Gingerich et al. 2012). Douglas PUD will compare three years of results (2011-2013) to examine year-to-year variability in behavior and life-history strategies. Douglas PUD will present findings to the HCP Coordinating Committee in 2014.

3.0 REFERENCES

- Bickford, S.A., T. Kahler, J. Skalski, R. Townsend, R. Richmond, S. McCutcheon, and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010. Public Utility District No. 1 of Douglas County. East Wenatchee, Washington.
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- Gingerich, A., T. Kahler, S. Bickford, R. J. Richmond, and C. S. McCutcheon. 2012. Wells Project subyearling Chinook life-history study, 2011 interim report, Wells Hydroelectric Project, FERC No. 2149. December 2012. 54 pp, plus appendices.
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- Summerfelt, R. C., and L. S. Smith. 1990. Anesthesia, surgery, and related techniques. Pages 213–272 in C. B. Schreck and P. B. Moyle, editors. *Methods for fish biology*. American Fisheries Society, Bethesda, Maryland.