**From:** Leah Sullivan [mailto:lsullivan@blueleafenviro.com]   
**Sent:** Thursday, February 14, 2013 2:44 PM  
**To:** Leonard, Nancy  
**Cc:** Curt Dotson; Russell Langshaw; Tom Kahler  
**Subject:** FW: actions from Jan FTF meeting [Use of PIT and acoustic tags for survival-based studies by Grant County PUD]

Nancy,

First, I’d like to provide some background information as it relates to the use of the two technologies, PIT and acoustic telemetry, by Grant County PUD (Grant PUD) and the evolution from PIT to acoustic telemetry methods used in survival studies in the Priest Rapids Project.  There were a number of reasons why Grant PUD considered and eventually transitioned to the use of acoustic tags to measure survival of juvenile salmonids between Rock Island Dam and Priest Rapids Dam.  Following the background information, you’ll find attached a comparison of costs (XLSX & shown below, more detail within embedded comments) and an explanation of the attached excel document.

**Background Information & Use of PIT Tags for Survival-Based Studies…**

Prior to the final BiOp (2008), Grant PUD downstream survival performance standard for juvenile salmonids was to meet a minimum of 86.49% survival through the entire Priest Rapids Project (Wanapum Reservoir + Dam and Priest Rapids Reservoir + Dam) as a consecutive three-year average, with a standard error of no more than 3.5% around the estimate.  Without actual survival information, yearling Chinook was considered the “surrogate for other juvenile salmonids.” In 2003, 2004, and 2005, PIT tags were used to measure the survival of yearling Chinook through the Project.  During these field studies, it was determined that approximately 156,000 PIT tagged and released yearling Chinook at Rock Island Dam tailrace would be required to meet the necessary precision of +/- 3.5% (and to meet this sample size demand, hatchery/fish husbandry support would be required). Based on passage performance, the sample size requirements were decreased in 2004; however, sample size goals of 110,000 could not be achieved in 2005 based on limited numbers of fish available (*only ~86,000 tagged fish, please note that costs for FY2005 would have increased if sample sizes were met*).

Since 2005, the 2006 SSSA (Salmon and Steelhead Settlement Agreement) and final 2008 BiOp (FERC License No. 2114) requires the same survival performance standards be met for each species, but with a more strict precision in the estimate – now 2.5%.  To continue survival based studies with the use of PIT tags, increased sample size requirements would be needed  totaling approximately 200,000-250,000 fish per year (sample size based on detection efficiency at McNary Dam).  Based on the increased sample size, there were concerns by Grant PUD of whether the increased sample size requirement could be met (“no room” to raise test/study fish).

**Consideration and Feasibility of PIT Replacement with Radio or Acoustic Tags Examined…**

During this period of time, Grant PUD reviewed the feasibility to use radio or acoustic telemetry in future survival based studies of other species (i.e., steelhead and sockeye) that would reduce the required sample size constraints in the use of PIT tags and Grant PUD found that the differences in costs between the use of PIT and radio/acoustic tags was insignificant (see attachment, three-year PIT study estimated at cost of $4.05M and three-year acoustic study estimated at a cost of $4.17M).  However, with an increase in sample size to 200,000-250,000 PIT tagged study fish, survival studies with PIT tags (*assuming study fish would be available,* *however unlikely),* the cost of such a study would exceed the cost of an acoustic based study design by a minimum of $2M.

During this review process, the PUD determined acoustic telemetry was the best choice.  Some of the reasons for choosing acoustic telemetry, instead of radio telemetry, included the added benefit of three-dimensional (3D) positioning in the forebays of each dam where (a) Wanapum Dam was in the process of installing a juvenile bypass and bypass efficiency and fish behavior was of interest, (b) a prototype top-spill bypass was being tested at Priest Rapids Dam and 3D passage behavior as well as bypass efficiency was of great interest to maximize collection of juveniles in the design of a new bypass, (c) high tag detection probabilities, and (d) no external antenna on transmitter.  It should be mentioned that several years of research upstream of the Priest Rapids Project by Chelan County PUD (first mentioned by Tom below, R&D beginning in the mid-late 1990’s) had proven this acoustic tag technology successful in measuring all of the characteristics listed above (to meet both fine-scale and large-scale study objectives with high precision).

**Acoustic Telemetry in Survival-Based Studies…**

Grant County PUD began conducting fish passage behavior studies with acoustic telemetry in 2004 (Hydroacoustic Technology, Inc. or HTI *Acoustic Tag Tracking System*) to test the design of a top-spill fish bypass at Wanapum Dam; additional behavioral studies were conducted in 2006-2007.  In 2008-2010, Grant County PUD used acoustic telemetry to measure survival of juvenile steelhead (and sockeye) through the Priest Rapids Project.  Additional behavioral studies have been conducted since 2007 with the use of HTI *Acoustic Tag Tracking Systems* and JSATS technology.

**Cost Comparison: PIT vs. Acoustic Telemetry…**

Second, and perhaps more important because it fills the FTF action item request, the research costs associated with the yearling Chinook PIT tag survival study (2003, 2004, and 2005) compared to the steelhead acoustic tag survival study (2008, 2009, and 2010) by Grant County PUD have been estimated (see attachment).  Please find attached the cost estimate comparison by category (i.e., costs associated with transmitters, fish husbandry, transport, collection and tagging, release, data collection, and analysis).  The cost estimates have not been reviewed in detail, but capture the main components.  We’d like to highlight that the following items are NOT included in the attached cost estimate comparison:

1.       Operation and maintenance (O&M) costs related to Grant PUD personnel that were involved in all facets of both PIT and acoustic telemetry studies from project management to seasonal staff that assisted in fish collection (gatewell dipping) and helicopter releases as well as the deployment and retrieval of tag detection gear;

2.       Initial acoustic tag infrastructure costs (costs associated with annual needs in equipment, due to repairs such as broken hydrophones, upgrades to equipment with GPS capabilities, or additional equipment needs *has been* included); and

3.       An effort was made to remove all non-essential “survival study” components to the cost comparison, such as any costs associated with the parallel behavioral studies at each dam forebay in each year (3D positioning of fish requires more equipment, labor in the field, data processing and analysis, etc.).

**Concluding Remarks…**

Based on cost per tag and simplistic design, it is sensible to initially believe that the use of PIT tags is cheaper for Grant PUD (no infrastructure within the Project for downstream passage detection of tags and transmitters are $2 per tag).  But, due to BiOp requirements – in particular the precision of the estimate that requires a large sample size, the cost differences between the use of PIT tags and acoustic tags, while not hugely different in this comparison, would have been at a sample size of 200,000-250,000 study fish.  **Estimated costs to continue survival-based studies with PIT tags in 2008-2010 would have been significantly more expensive by an added $2.2M to $3.6M over the use of acoustic telemetry (all natural resource, non-financial impacts not considered in comparison, only tag quantity, husbandry, transport, handling/tagging, release, and research requirements) to meet required precision.**

Similar to Chelan PUD, the added components the acoustic tag has proven beneficial to Grant PUD in designing and constructing bypass structures at both dams with high passage collection efficiencies (>70% steelhead and sockeye at Wanapum Dam; 3D passage behavior (2006-2009) at Priest Rapids Dam was used in the design concept of Priest Rapids bypass, *currently under construction*).

Nancy, please feel free to give me a call if you want to discuss this further or if I’ve left anything unanswered.

I’m looking forward to meeting the morning of February 19th for coffee prior to the FTF meeting.

Thank you.

Leah

