**Fish Tagging Forum**

**Meeting Notes**

**Monday January 7, 2013**

**Northwest Power and Conservation Council**

**Attendees:** See attendance list on the Fish Tagging Forum website at <http://www.nwcouncil.org/fw/tag/>

**Introductions/Meeting Objectives/Recap of Last Meeting**

Kevin Kytola provided an overview of the topics and work to be accomplished today.

The Forum added an item to the [agenda](http://www.nwcouncil.org/fw/tag/2013_01/agenda.pdf) to discuss the potential presentation to the Council during the February 12-13, 2013, Council meeting.

**BPA Cost Information (Rick Golden)**

Rick Golden summarized the information he has assembled to-date on the sunk costs associated with PIT Tags. Rick’s current estimate is that about $30 to $35 million total costs are associated with PIT tags. This updated estimate combines two sources of expenses:

* Infrastructure-related expenses from a presentation he found prepared by the PSMFC-PTAGIS. This presentation provides a rough estimate of the investment funded by BPA for PIT tag detection and data collection in the Columbia Basin since the switchover from the 400kHz system to the existing ISO 134.2kHz systems. This does not include any projects that are currently in place on the upper Columbia which are funded primarily through various PUD’s or USBR ([BPA PIT tag investment](http://www.nwcouncil.org/fw/tag/2013_02/BPA_pit_tag_investment.pptx)). This presentation provides an estimate of about $25 million for the above PIT tag investment. The $25 million only includes infrastructure costs by the Portland and Walla Walla districts of the COE and the Yakama Nation in the Yakima River system.  Thus, it does not include any of the PUD or USBR expenditures or any expenditure for tributary detectors.
* BPA estimates that another $5 – 10 million has been spent on tributary detectors, including the Willamette and LSRCP.
* FY 12, BPA purchased 1,542,300 PIT tags for project sponsors at a cost of approximately $3 million.

***Group Discussion:***

The Forum discussed that the $30 million for PIT Tag cost is not an exact figure, and does not capture future upgrades that will be paid by Bonneville funds. Doug Marsh indicated that mainstem transceivers may need to be replaced in the next 2 to 3 years. The cost estimate does not include the data management and analysis associated with this tagging technology which is something that may need to be captured to compare across tag technologies. The Forum agreed that there needs to be consistency in what components (e.g., tag cost, infrastructure, recovery cost, data management and analysis) will be included when calculating the cost of a given tagging technology and to ensure a fair comparison across technologies. However, this may not always be easy to accomplish since some emerging technologies may not already have costs for all these components. For example, the genetic tagging technology does not have a searchable database at this time, although efforts are underway to build one (e.g., about $400,000 to initiate this endeavor has been requested but additional funds will be needed for long-term maintenance, et cetera). Furthermore, the Forum discussed how to capture the “free-rider” / “spill over benefits” that are associated with some of the tagging technologies. For example, many individuals don’t pay for PIT tag detection but benefit from the compiled tag detection information.

The Forum agreed that the calculated cost needs to capture the entire lifecycle of the tag technology (marking – recovery – data management -- analysis).

The Forum also restated the importance of capturing what proportion that Bonneville pays for with respect to the whole cost associated with a tagging technology. It was noted that BPA and the Corps are still working on a pie chart of PIT tag cost data, which should be available at the February meeting.

Caution was noted about not assuming that tagging technology with a smaller cost would have a negligible role in the model since it may inform and identify a more cost-effective alternative.

For developing Council recommendations and to address the cost-effectiveness and the fair-share issue, the Forum will need to determine what level of specificity it will need to have when estimating the cost associated with each tagging technology. The Forum also needs to have adequate information to provide the Council with alternatives and tradeoffs in their recommendations.

The IEAB economic model may also require a more specific break down of the costs associated with PIT tags than the lump sum provided. However, the Forum at this time is not certain of what cost information would be needed for the IEAB model. As the model is developed, the model may highlight where more specific cost information is needed.

***Action:*** The cost topic will remain on our agenda for February so that we can discuss the updated pie chart that illustrates what proportion is paid by Bonneville versus others. The Forum will also discuss what level of cost specificity is needed for making Council recommendations and for informing the IEAB model.

**IEAB Cost Effectiveness Evaluation Framework (Bill Jaeger)**

Bill Jaeger provided an update on the work done thus far by the IEAB for developing an initially simplified version of the model that could inform cost-comparisons among tagging technologies used to inform the same indicators.

Bill Jaeger stated that his presentation ([IEAB presentation](http://www.nwcouncil.org/fw/tag/2013_02/ieab.pptx)) serves to introduce the Fish Tagging Forum (Forum) participants to the type of questions the model could inform and how the model functions so that the Forum will have a better understanding of the type of information the model will need.

Bill Jaeger mentioned that the model provides information people can use to determine what course of action may be best. An initial first step for developing a model is to have clear objectives/questions that guide the model and can be used to optimize the model. For example, we can optimize the model to address the question of cost-effectiveness, positive spillover effects (i.e., “free-riders”), budget constraints, priorities, et cetera.

The type of information needed by the current model developed by the IEAB was discussed and is summarized on the Nut and Bolts slide of the presentation. Some information needed for the model includes the number of fish required to be detected at a given location, the minimum number of fish that need to be tagged and the minimum number of detections needed.

*Group Discussion*

The Forum discussed the type of guidance that the IEAB model could produce. Basically the model could, when there is a tagging technology choice for an indicator, assess which technology to use based on cost, or other objective such as positive spill effects, to identify the lowest cost way to inform that indicator. The model can be constrained as wanted, such as by removing certain technologies or limiting the budget. The model could be run to optimize anything that can be conveyed by an equation, if an equation could convey optimizing minimal fish handling the model could solve for that. The model could also inform the right mix of tag technologies for particular questions/indicator if an equation can be developed to convey how two (or more) tags complement each other.

The Forum discussed that the model should be constructed consistent with its intended uses. Considerations include:

* Using the model as a short-term tool focused solely on informing the FTF recommendations, versus a long-term tool that could be used by others, such as by those preparing a research proposal in the future.
* Using the model as a tool to aid in the evaluation of cost consequences associated with specific recommendations, versus a tool that is used to run more general scenarios as a means to identify areas where recommendations could be made based on cost-driven opportunities for improvement.

The Forum supported the suggestion to first develop the recommendations and then assess whether and how the model can assist with informing the recommendations. Perhaps the model can be a tool that helps add cost details to the recommendations and/or evaluate the recommendations. Thus the development of Forum recommendations and application of the model will be an iterative process.

The Forum discussed how the model could be applied at a basin-wide scale given the uniqueness of each tagging technology. Regardless of the geographic scale, the model would be applicable where there is a possibility of tagging technology substitution; the model would not be applicable when there is no potential tagging technology substitute. It may be more informative to apply the model to specific applications for specific cost-effectiveness questions which directly inform the recommendations being developed.

The Forum discussed how it needs to make reasonable choices to build a practical model in terms of how much detail to capture for various species, hatcheries, dams, detection points, et cetera. The Forum discussed whether the IEAB should focus the initial model on only two fish species, such as spring Chinook and steelhead.. The Forum discussed how perhaps the IEAB economic model be tested on a small scale, such as by modeling Idaho’s current usage of genetic markers compared to using CWTs in the Snake Basin? The IEAB could focus on indicators 1B and 2A, 3B of the Hatchery Management Question first, evaluating the trade-offs between genetic marks and the CWT technologies. This is a potential approach that should be considered, because by running a subset of the whole system this approach could be used to test the economic model, unless there are inter-dependencies that are lost on a smaller scale.

One concern related to constraining the model to two fish species is whether that constraint would capture the majority of Bonneville’s tagging investment. Another point for consideration that may inform the constraints on the model was whether it was intended to focus on hydrosystem passage (in which case the model should include COMPASS fish species), or if the model is targeted to address harvest-related questions (in which case it will need to include fall Chinook). Another concern with constraining the model too much is that we may not be able to fully capture the positive spillover effects (i.e., “free-riders”) that may be occurring. Perhaps the modeling exercise can be made more manageable by focusing on the number of tags recovered, or the percent of the tagging budget spent on a given tagging technology, and we can eliminate from the modeling exercise questions and indicators that can only be answered by one tagging technology.

The Forum discussed the type and location of information that could be used to inform the model. For the model’s information needs related survival rates, three potential sources have been identified by Council staff: NOAA’s annual ESA Sec. 10 permitting memo, CSS reach survivals or NOAA’s empirical data on reach survivals. For mainstem survival rates it was suggested that the model use the average empirical NOAA annual reach survival estimates for juvenile fish and NOAA’s rolling 5-year average adult PIT tag reach survivals for upstream passage estimates.

Regarding obtaining the number of fish that need to be tagged and recovered, this information is generally included in the original project proposal. However, the actual number of fish needed for these two parameters will vary greatly depending on the purpose of the study, how much difference you want to detect between two study treatments, so it is not certain how useful this information will be. Some project proposals can be found on Bonneville’s cbfish.org web site and others are found on the Corps’ AFEP website.

The Forum suggested extracting information from research proposals related to sampling rate. The Forum also discussed the current understanding of the number of tags and recoveries needed to obtain a given confidence interval or some other desired result. It was mentioned that in many cases studies are tagging fish to learn how many tagged fish are recovered, so the number of fish identified in the proposal is not necessarily the actual number that would be needed, since for some tagging technologies we are still learning. Whereas, for other tagging technologies we have a pretty good understanding of the number of tagged fish and level of detection needed (e.g., for acoustic tags). For other tags, the numbers will always vary since their recovery rate will depend on external factors that are not controllable such as river flow (e.g., for PIT, CWT and genetic tags).

The Forum also discussed whether study proposals include a discussion of the tradeoffs between various tagging technologies to best address their study question. In general, study proposals submitted for ISRP review and those found on CBFish.org do not have that type of information. The PUDs have done some studies assessing the difference between tagging technologies when they switched in 2004 between PIT tags to acoustic tags (Grant County PUD). Douglas PUD uses PIT Tags; however, Chelan PUD uses acoustic tags for survival studies. There was some discussion about the value of this type of information since it would not be a consistent comparison for all studies, because to conduct a cost-effectiveness comparison, the same question needs to be answered by more than one tagging technology.

What about considering monitoring and research studies separately since the approach for determining the needed number of tags and detections may differ? In monitoring studies you just tag a bunch of fish, but research needs to identify a different amount of tags depending on what is expected in terms of difference between treatment groups. That number differs depending on the study. One way to simplify coming up with numbers for the economic model is to think of a representative situation, not all the unique situations. Perhaps the model can focus on the FCRPS BiOp RPA-related studies, since those are the long term sets of questions. But that approach would omit the treaty obligations such as *US v OR*, and other questions that we may need to consider to capture the diversity of Bonneville-funded studies that use tags. Would addressing questions related to the Pacific Salmon Treaty, FCRPS BiOp, and *US v OR* suffice?

The Forum also discussed the need to account for the variability in the tag life, since some tags are meant to be used for only a month or two while others are meant to be used for years. The IEAB model will be able to capture this variability in the tag technologies. The length of the study and the type of the study will also impact the type of tags used and the number of tags used.

Other information for genetics, CWTs and PIT tags that the IEAB model needs within the next 3-weeks, preferably from publications or technical experts if publications are not available:

* Who to contact for potential array locations to build into the model?
* Where to obtain the activity costs, which consists of annualized variable costs and fixed costs, such as the fixed cost of installing a detector?
* Who to contact and where to obtain more information about genetic tagging?

Tom Kahler (DPUD) stated that Chelan PUD may be a source of information related to cost tradeoffs between PIT and Acoustic based on their studies in the early to mid-2000s.

**Action:**

Leah Sullivan will look at whether there are examples of change in tag numbers needed and costs when the PUD switched tag technologies to answer the same management question. This may include the switch in 2004 from PIT tag to acoustic tags (Grant County PUD).

The following individuals were identified by the Forum to assist Bill Jaeger in providing or identifying information sources for the IEAB model related to tagging costs for:

* Genetic Marks
  + Matthew Campbell IDFG
  + Shawn Narum CRITFC
  + Pete Hassemer IDFG
  + Rick Golden BPA
* Coded Wire Tags
  + Tom Rien ODFW
  + George Nandor PSMFC
  + Guy Norman WDFW
  + Rick Golden BPA
* PIT Tags
* Guy Norman WDFW
* Tom Rien ODFW
* Pete Hassemer IDFG
* Doug Marsh NOAA–NWFSC
* Leah Sullivan Grant PUD
* Doug Marsh also suggested that we contact hatchery folks to provide insight on PIT tag use in the tributaries and that perhaps Pete Hassemer can suggest some contacts.

**Scenario Analysis – Genetic Marks (Kevin Kytola)**

Using the Management Question and Indicator Network Diagram [Spider Chart](http://www.nwcouncil.org/fw/tag/2013_02/spiderchart.pdf), the Forum will explore the value of genetic marking by identifying the theoretical consequences of not investing in the application of genetic marking.

For each of the six categories of management questions, a smaller set of spider diagrams were created. These were used to illustrate what information would be lost when a specific tagging technology was “removed,” or not used (see [Genetics Elimination](http://www.nwcouncil.org/fw/tag/2013_02/genetics_elimination.pdf) and the [CWT Elimination](http://www.nwcouncil.org/fw/tag/2013_02/cwt_elimination.pdf)).

The purpose of this scenario analysis, as discussed during the December 2012 Fish Tagging Forum meeting (see http://www.nwcouncil.org/fw/tag/2012\_12/notes.pdf pp. 4-5), is to think through the consequences of removing funding for a particular tag technology. This could include assessing how the lost of data from a given tagging technology would impact information available for informing management questions, indicators, species, and geographic coverage. As well as assessing the the consequences related to shared resources, the net cost, and the consequences and merits of changing funding strategies for particular tag types.

*Group Discussion*

The Forum discussed the example with genetic marks “removed” ([Genetics Elimination](http://www.nwcouncil.org/fw/tag/2013_02/genetics_elimination.pdf)). For indicators identified as important for the Fish and Wildlife Program, the Forum identified which of the tagging technologies is currently the primary source of information and which is currently a secondary source of information. The other tagging technologies associated with an indicator were not ranked. It is important to note that what is identified as the “primary” is the technique most commonly used today and may not represent the best technology for the question or provide complete coverage.

Below is a listing of primary and secondary designations for the indicators that were discussed (note that there was not a complete assessment of all indicators at this time, for all indicators, questions, and tagging technologies see [Management Questions](http://www.nwcouncil.org/fw/tag/2013_02/management_questions.xlsx) ). Attached is a revised diagram depicting the information graphically.

Hatchery Management Questions:

*Note: For Indicator 1B and 2A/3D, the use of genetic tagging is being developed as the primary tool in Snake River Basin. Genetic tagging is being used as a supporting tool now in both WA or OR, but may become more significant in future. For all other indicators, genetic marks are supporting unless otherwise noted.*

* Indicator 1A – only Pit tags are used to gather data for this indicator, thus PIT tags are primary.
* Indicator 1B – CWT is the primary tagging tool; genetic tagging is the secondary/supporting tagging tool. Genetics is in transition to primary tool with it currently being the primary tool in the Snake River Basin (SRB)
* Indicator 1C– CWT is the primary tagging tool; genetic tagging is the secondary/supporting tagging tool.
* Indicator 2A/3D– CWT/Adipose fin clip is the primary tagging tool. Genetics is an emerging primary tagging tool. Without genetics, we would have to CWT at a much higher rate.
* Indicator 2B/3E– relies heavily on genetic markers as a primary tool, with other marks used to identify HOS.
* Indicator 3A– Adipose fin clip is the primary tagging tool.
* Indicator 3B– PIT tags are the primary tagging tool.
* Indicator SAR– CWT is the primary tagging tool. Genetics has a future potential for being the primary technology.
* Should we add “diversity” as an indicator to Hatchery sheet? Possibly, let’s wait and see when we finish this exercise.

Habitat Management Questions:

* Indicator 1A – PIT tags are the primary tagging tool.
* Indicator 1B – has no primary tagging tool.
* Indicator 1C – PIT tags are the primary tagging tool.
* Indicator 1D – Radio tags are the primary tagging tool.
* Indicator 1E – PIT tags are the primary tagging tool.
* Indicator 1F – Radio tags are the primary tagging tool.
* Indicator 1H – PIT tags are the primary tagging tool.
* Indicator 1I – Radio tags are the primary tagging tool.
* Indicator 1K – PIT tags are the primary tagging tool.
* Indicator 1J – PIT tags are the primary tagging tool.
* Indicator 2A - genetic marks are a primary tool,
* Indicator 2D – PIT tags are the primary tagging tool.
* Indicator 2C – PIT tags are the primary tagging tool.
* Indicator 2H – Genetic marks are the primary tool and is irreplaceable.
* Indicator 3A – Acoustic tags are the primary tagging tool.
* Indicator 3B – Otolith marks are the primary tagging tool.
* Indicator 3C – PIT tags are the primary tagging tool.
* Indicator 3D – Otolith marks are the primary tagging tool.
* Indicator 3E – PIT tags are the primary tagging tool.
* Indicator 3F – No primary tagging technology identified. Genetic marks is supporting
* For all indicators on left side of Habitat sheet (1A, 1C, 1E, 1B, 1D, and 1I), genetic marks are a weakly supporting tool.

Hydro Management Questions:

* Indicator 1A – PIT tags are the primary tagging tool.
* Indicator 1B – PIT tags are the primary tagging tool.
* Indicator SAR– PIT tags are the primary tagging tool.
* Indicator 3G – PIT tags are the primary tagging tool.
* Indicator 4D – genetic marks are the primary and only tagging tool for spawning success component; but CWTs are the primary tool for the tributary survival and straying rate components.

Harvest Management Questions:

* Indicator 1A – CWTs are the primary tagging tool; could still do work without genetic marks.
* Indicator 1C – CWTs are the primary tagging tool; could still do work without genetic marks.
* Indicator 1E – CWTs are the primary tagging tool; genetics is secondary now, but it has a future application. Without genetic marks, we would lose a lot of useful info.
* Indicator 1F – CWTs are the primary tagging tool; genetic marks are secondary now, but it has a future application. Without genetic marks, we would lose a lot of useful info.
* Indicator SAR – not identified
* Indicator 3C – CWTs are the primary tagging tool; in general, we could still do work without genetic marks. However, genetic markers (PBT) are a primary tool in the Snake River Basin.

Population Status and Recovery Management Questions:

* Indicator 1A – is data poor and uses genetic markers (GSI) as primary tool for SR steelhead; PIT tags are secondary tool. Genetic markers are probably a secondary tool for remainder of the CRB.
* Indicator 1B – genetic marks are the primary tool; without genetic marks, we would use PIT tags.
* Indicator 1D – genetic marks are an emerging tool; without genetic marks, we could use other tools, such as PIT tags.
* Indicator SAR – not identified

Predation Management Questions:

* On the Predation page, genetics could be an emerging, useful tool to determine particular stocks that are being preyed upon by either avian or marine mammals. No changes to the applicable tags will be incorporated at this time.

The Forum discussed how these graphics could be used during the final analysis and report as references in the discussion of each of the tagging technologies. The graphics could also be summarized by each of the six major topics. These graphics could be useful in helping to explain alternate courses of action associated with the Forum recommendations to Council.

The Forum discussed how much information about productivity and diversity is really necessary for the region to collect in the Columbia River Basin, as this could inform the priority of the various indicators.

**Scenario Analysis – Coded Wire Tags (Kevin Kytola)**

Using the Management Question and Indicator Network Diagram, the Forum will explore the value of CWTs by identifying the theoretical consequences of not investing in the application of CWTs ([CWT Elimination](http://www.nwcouncil.org/fw/tag/2013_02/cwt_elimination.pdf)). Hard copies of the diagrams were handed out at the meeting. This topic and discussion was deferred to the February 19, 2013, Fish Tagging Forum meeting.

**Recap and Plan Next Meeting**

*Group Discussion*

Kevin suggested that the Forum participants begin to formulate recommendations based on the genetic marker information compiled and discussed to date. This will provide an opportunity to get the group aligned on the focus and level of detail associated with the recommendations.

Kevin provided a handout about the basis of Forum recommendations and questions for the group to review and consider. Kevin also provided a handout of initial definitions for Program Effectiveness, Biological Effectiveness and Cost Effectiveness. Forum participants were asked to review and comment on the information in preparation for future discussions ([Definitions and Questions](http://www.nwcouncil.org/fw/tag/2013_02/definitions.docx)).

**Next Meeting**

The next Forum meeting will be Tuesday February 19. Agenda items will include

1. get an update on tag cost analysis from BPA and Corps,
2. update from IEAB on economic modeling effort,
3. review draft recommendations for genetic markers, and,
4. complete the scenario analysis for removing CWTs.