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## MEMORANDUM

**TO:** Chairman Measure and Council Members

**FROM:** Therese Hampton, Forum Chair and Tony Grover, Fish and Wildlife Director

**SUBJECT:** Fish Tagging Forum Update

The Fish Tagging Forum has met twice in 2011 and has focused on gaining an understanding of the Council's objectives for the Forum and developing a path forward to meet those objectives. The Forum also began to explore the tagging technologies, methods and applications in the Columbia Basin by hearing from experts at the Army Corps of Engineers, Grant PUD, Chelan PUD and the U.S. Geological Survey regarding acoustic tags.

### Objectives

The following is extracted from the charter for the fish tagging forum:

*The Fish Tagging Forum will advise the Council regarding the following issues. Activities of the Forum will include:*

- (A) Developing and recommending to the Council a commonly accepted description of fish tagging funded by Bonneville Power Administration, including what fish are tagged and released and recovered, in what numbers, where, by what entity, for what purposes and at what cost.*
- (B) Recommendations to the Council on ways to improve the cost effectiveness of fish tagging under the Fish and Wildlife Program.*
- (C) Recommendations to the Council on ways to improve the program effectiveness of fish tagging to address key management questions under the Fish and Wildlife Program.*
- (D) Describe the various data systems used to organize and track tagging data including recovery information.*
- (E) Describe the degree of coordination within and among tagging efforts and recommend improvements in coordination within and among tagging efforts where efficiencies and cost effectiveness may be improved.*
- (F) What is the objective of each tagging effort and are the right tags being used, or proposed to be used, to accomplish that objective. If the objective can be achieved by different means, how does the cost differ between options?*

*(G) Review issues related to fish tagging, such as the adequacy of geographic coverage, span of species diversity or completeness of life cycle tracking. The forum could provide recommendations on cost efficient, technologically practical and acceptable changes to current tagging programs.*

The Forum discussed the Council objectives at the first meeting, with consideration about how to achieve the objectives and what the scope of the Forum's activities would be. The result of the Forum discussions was to engage the objectives in the following manner:

A. Developing and recommending to the Council a commonly accepted description of fish tagging funded by Bonneville Power Administration, including what fish are tagged and released and recovered, in what numbers, where, by what entity, for what purposes and at what cost. Additionally, the forum participants will describe similar efforts in the Columbia Basin that are outside of the BPA funded programs including their connection to answering multiple management questions. The descriptions will include identification of the obligation or authority that drives the tagging effort.

B. Recommendations to the Council on ways to improve the cost effectiveness of fish tagging under the Fish and Wildlife Program.

C. Recommendations to the Council on ways to improve the program effectiveness of fish tagging to address key management questions under the Fish and Wildlife Program. (Considerations regarding and attributes of "effectiveness" will need to be defined as part of the forum.)

New Objective 1: Recommend "fair share" allocation of responsibilities for funding fish tagging relative to each management question. Forum participants feel that a discussion of fair share, which was not within the ISAB's mandate, is an important factor in determining the policy issues related to tagging efforts funded by BPA.

New Objective 2: Respond, as appropriate, to 2009 ISRP recommended actions.

The Forum members felt that some work needed to happen first, before some of the Council's objectives could be accomplished. As a result the Forum recommends that the following preliminary work is required to support the above objectives above:

1. Originally Objective (D): Describe the various data systems used to organize and track tagging data including recovery information.
2. Originally Objective (E): Describe the degree of coordination within and among tagging efforts and recommend improvements in coordination within and among tagging efforts where efficiencies and cost effectiveness may be improved.
3. Originally Objective (F): What is the objective of each tagging effort and are the right tags being used, or proposed to be used, to accomplish that objective.
4. Originally Objective (G): Review issues related to fish tagging, such as the adequacy of geographic coverage, span of species diversity, adverse biological impacts or

completeness of life cycle tracking. The forum could provide recommendations on cost efficient, technologically practical and acceptable changes to current tagging programs.

5. NEW: Description of future considerations related to management questions and related fish tagging efforts.

To ensure clarity in communication the Forum infers the definition of “Tagging” includes: tagging, release, recovery of tags, and assessment; which is the full life-cycle of a tagging effort.

The Forum members have agreed the following outcomes for the Fish Tagging Forum are desirable:

- Develop a common understanding and documentation of relationship between current tagging efforts and management questions.
- Identify opportunities to improve coordination, efficiency and cost-effectiveness.
- Make recommendations to the Council for improving cost and program effectiveness.

### **Technologies**

The first technology explored in detail was acoustic tagging (tags that make a sound that is detectable through underwater listening devices). The next technology to be reviewed will be genetic tagging and tracking methods.

Attached is a draft table that includes the information related to acoustic tagging which has been gathered from the experts at the U.S. Army Corps of Engineers, Chelan PUD, Grant PUD and the U.S. Geological Survey.

FTF Charter Objectives	Attributes	Acoustic
3a	What fish are tagged	Primarily juvenile Chinook, <b>sockeye</b> , and steelhead. Some kelt, <b>juv. and adult</b> sturgeon, bull trout, <b>adult</b> lamprey, walleye, <b>northern pikeminnow</b> , <b>smallmouth/largemouth bass</b> .
3a	Number fish released	For FCRPS BiOp: <b>[2012]</b> 24,000 fish in Lower Columbia River, and 24,000 in the Snake River. In response to 2008 BiOp for the Willamette River, evaluating down stream passage options at Cougar and Detroit projects. 1. Cougar: 1000 juvenile Chinook tagged; <b>100 wild origin</b> (natives?) from reservoir, the rest hatchery fish; 2. Detroit project: 1200 fish. 300 kelt. 60 lamprey. Very limited bull trout data.
3a	Number fish or tags recovered	Unknown
3a	Entity releasing fish	USCOE; Grant County PUD ; Chelan County PUD, some USGS and USF&WS
3a	Entity recovering/ <b>detecting</b> fish	USCOE; Grant County PUD; Chelan County PUD, some USGS and USF&WS
3a	Purpose of tagging	<b>Project, Pool, and</b> Dam passage survival and <b>forebay</b> three dimensional behavior.
3a	Cost of tagging	<b>Costs vary by manufacturer, tag type, and quantity.</b> JSATS costs for tags is currently around \$200 per tag <b>with</b> a goal to get tag price down to around \$100. Receivers: \$3,000 to \$9,000 each, \$19,000 each for cable arrays.
3b	Cost effectiveness of tagging	Typical studies cost about \$6.5M to assess survival of three species across three dams, for example, from John Day to Bonneville. The studies follow a standard protocol. Full program cost for Lower Columbia survival studies is about \$13M per year. Willamette program cost is about \$2M to \$3M per year. Jim Ruff will review available information to confirm or modify this range estimate.
3c	Program effectiveness relative to key FW Program mgmt questions	Mainstem strategy & Council draft mgmt question & Council HLI
3d	Data system for organizing and tacking tag data (release and recovery)	Entity reports
3e	Degree of coordination within tagging efforts	Monthly meetings of JSATS user group.
3e	Degree of coordination among tagging efforts	Monthly meetings of JSATS user group.
3f	Best tag suited for a given objective	Yes for 3D tracking purposes, such as passage route and timing measurement through a dam <b>and reservoir</b> or tracking movement of fish in a complex environment.

3g	Adequacy of geographic coverage	Willamette and Columbia rivers. For example, John Day dam required 92 detectors.
3g	Span of species diversity	Broad applicability, though locations/cost of detectors and tag life and range are significant. There is a reservoir study for adult Lamprey that has a tag designed to last 400 days (greater time between pulses).
3g	Completeness of life cycle tracking	Short, typically just over a month. <b>Juveniles limited to two Projects at most, depending on reservoir length</b>
3c	Limitations	Limitations of technology include: life of transmitter, interference from ambient noise (requires higher frequency of signal), and code space. Surgical implantation is required. Too big for smallest subyearlings. Range of detection is about 75 to 300 meters, less in noisy environments and greater in quiet environments. Shallow water results in low signal to noise ratio, which limits the tag usefulness due to echos, false positives, poor 3D geometry, etc. Tag life is dependent upon the <b>ping rate (pulses per second) chosen</b> , frequency of signaling and battery performance. There are currently ~60,000 unique tag codes in the <b>JSATS</b> ; each tag has a 31 bit code <b>and codes</b> are currently managed by USACE (Brad Eppard).
3d	Data availability	Limited due to technically challenging post processing required before raw information can be used. UW retains the data in an archive.
3f	Benefits	<b>Reservoir survival, and</b> Dam passage survival that is route specific & can observe fish behavior in forebay
3b	Cost of receivers	Receivers costs depend on technology. <b>JSATS</b> autonomous receivers are <b>\$3,000 (Lotek) to \$8-9,000 (ATS, Teknologic)</b> and cables receivers are about \$19,000.
3c	Confidence interval	Confidence interval for the USACE survival studies is 95% +/- 2 to 3%; Chelan <b>and Grant</b> County PUDs <b>have</b> 2.5% standard error
3f and 3g	Alternative tagging technology	PIT and Acoustic Tags can be used for similar measurements (e.g., dam passage survival), they have different benefits and limitations that keep one technology from being a wholesale replacement for another <b>in a multi-dam system</b> . Radio telemetry was used to study passage through Cougar Dam.
3c	Tag loss (shedding) rate	Unknown
3c	Tag failure rate	<b>JSATS tag failure rate generally less than 1%; tag life</b> rated at 33 days at 3 second pulse rate at <b>417 dB</b> .
3c	Increased mortality due to tagging	Some, decreasing with shrinking tag size; <b>additional tag-induced vulnerability to predators unknown</b>

<b>Juvenile Measurements</b>		
<b>Salmonids</b>	Number and timing of juvenile releases	no
<b>Salmonids</b>	Number and timing of juveniles migrating from tributaries	no
<b>Salmonids</b>	Number and timing of juveniles entering the hydrosystem	no
<b>Salmonids</b>	Number and timing of juveniles entering each hydroproject	yes, for some projects
<b>Salmonids</b>	Number and timing of juveniles exiting each hydroproject	yes, for some projects
<b>Salmonids</b>	Number and timing of juveniles exiting the hydrosystem	yes, for some projects
<b>Salmonids</b>	Number and timing of juveniles entering estuary	possibly
<b>Salmonids</b>	Number, location and timing of juveniles removed by predators	<b>yes, for some projects</b>
<b>Adult Measurements</b>		
<b>Salmonids</b>	Number, location, and timing of adults in ocean	no
<b>Salmonids</b>	Number and timing of adults in estuary	no
<b>Salmonids</b>	Number and timing of adults entering the hydrosystem	no
<b>Salmonids</b>	Number and timing of adults entering each hydroproject	no
<b>Salmonids</b>	Number and timing of adults exiting each hydroproject	no
<b>Salmonids</b>	Number and timing of adults exiting the hydrosystem	no
<b>Salmonids</b>	Number and timing of adults entering tributaries	no
<b>Salmonids</b>	Number, location and timing of adults on spawning grounds	no

<b>Salmonids</b>	Number, location and timing of adults removed by predators	no
<b>Salmonids</b>	Number, location and timing of adults removed by harvest	no