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August 20, 2013

Mr. William C. Maslen
Manager, Fish and Wildlife Division
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Maslen:

The purpose of this letter is to advise you of the Council's decisions and recommendations to Bonneville in response to the Fish Tagging Forum's recommendations to the Council. These recommendations were made by the Council at its meeting on August 7, 2013.

The following is a summary of the actions taken by the Council at the meeting in August.

Fish Tagging Forum process and recommendations

The Fish Tagging Forum (Forum) was chartered by the Northwest Power and Conservation Council (Council) in July 2011. The Forum was directed to evaluate the fish tagging activities and their cost-effectiveness and program effectiveness under the Fish and Wildlife Program (Program), as well as other issues identified in the March 2009 ISAB/ISRP report (ISAB/ISRP document 2009-1) regarding fish tagging technologies and programs.

The Forum held fifteen in person all-day meetings of the full Forum as well as numerous subgroup meetings and conference calls between November 2011 and April 2013. The meetings have been regularly attended by 15 to 30 subject matter experts from the following entities: Bonneville Power Administration (BPA), United States Army Corps of Engineers (USACE), National Ocean and Aeronautics Administration (NOAA), Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), Pacific States Marine Fisheries Commission (PSMFC), Columbia River Inter-Tribal Fish Commission (CRITFC), the Mid-Columbia Public Utility Districts (PUDs), and BPA customer groups (Public Power Council, Northwest River Partners). At times the Forum meetings were also attended by Council members, representatives from the Nez Perce Tribe, the Grand Ronde Tribe, the United States Fish and Wildlife Service (USFWS), the United States

Geological Survey (USGS), consultants, equipment vendors, universities, and other interested parties. Council staff participated in all Forum meetings and teleconference calls.

The Forum Charter (<http://www.nwcouncil.org/media/23450/charter.pdf>) defines several specific objectives for the Forum. A synopsis of accomplishments relative to each of the Charter objectives is provided in Attachment 1. Presentation materials, meeting summary notes, and related documentation are available at <http://www.nwcouncil.org/fw/tag/home/>.

A number of information synthesis tools have been developed to support the development of recommendations, including:

1. Tag-specific summaries;
2. Tag infrastructure schematic;
3. Data collection and management schematic;
4. Management Question and Indicator Spreadsheet;
5. Management Question, Indicator, and Tagging Technology Network Diagram;
6. Tag-specific Cost Information (from BPA and USACE).

Background

The ability to mark and tag fish is one of the most important and useful techniques available to fishery managers, researchers and those interested in, or with a legal requirement of, preserving and recovering threatened or endangered fish, particularly salmon and steelhead. Tagging or marking salmon, steelhead and other fish species using tag technologies is a key tool for monitoring and evaluating both juvenile and adult salmon passage from headwater rearing or release areas through the mainstem hydropower projects, into the ocean, and back to the spawning grounds or hatchery broodstock collection areas.

The Council has not previously conducted an effectiveness oriented, policy level review of tagging and marking associated with the Fish and Wildlife Program. However, the Council and the ISRP have reviewed at one time or another all tag related projects within the Fish and Wildlife program.

The Council did request the Independent Science Advisory Board (ISAB) and Independent Science Review Panel (ISRP) to conduct a joint comprehensive review of Columbia River Basin fish tagging technologies and programs, which was completed on March 17, 2009 (ISAB/ISRP 2009-1). That report focused on the scientific and technical aspects of the various tagging technologies and stopped short of a policy level review of tagging. In that report the ISAB/ ISRP stated: *“For proposal solicitations, the ISRP’s technical review is not designed to address cost effectiveness. If project budgets appear unreasonable, either too large or too small, concern is often expressed, although this is not a technical review task. This is an aspect of tagging that would be best addressed as part of the Fish and Wildlife Program amendment and program-level decision process... As important as cost effectiveness is program effectiveness. Program effectiveness of tagging activities might be better incorporated into decision management frameworks where reference points from tagging activities trigger management response (e.g., return rates or harvest rates at a fixed limit or threshold).”* As a result, the policy issues of cost effectiveness and program effectiveness remained unexplored until the Council created the Fish Tagging Forum.

Since the Council's last review of tagging issues in 1997, several major events have occurred in the Columbia Basin. They include, but are not limited to: several Council reviews of tagging projects, three FCRPS Biological Opinions, in lieu determinations by BPA and numerous tagging technological improvements and infrastructure changes. Because of these events, it is appropriate for the Council to reassess its views on fish tagging under the Council Fish and Wildlife Program.

In June 2010, the Council and Bonneville together began a review of projects in the categories of research, monitoring and evaluation and artificial production (also known as the RME/AP Review).

In June and July of 2011 the Council made following recommendations related to Coded Wire tag projects, which also included the intent to consider chartering a facilitated work group consisting of coded-wire tag project sponsors and Council and Bonneville staff and others to address the need within the Fish and Wildlife Program for coded-wire tag information. In July of 2011 Council members expanded the scope of the facilitated workgroup to include all tagging technologies in the Program, which is the genesis of this Fish Tagging Forum (Forum).

The Council recommends funding for the coded-wire tag projects for two years only, at the requested FY2012 level. The funding recommendation would be conditioned on the project sponsors, within that time, working with the Council staff to develop an overarching plan for ISRP review to coordinate the tagging of salmon throughout the Columbia River Basin, including the recovery of coded-wire tags in the fisheries, on the spawning grounds and elsewhere. In that plan, the sponsors should:

- *address the ISRP's concerns and comments, including evaluating the magnitude of mini-jacks among yearling coded-wire tagged Chinook salmon releases, and recording mini-jack data in the RMIS database);*
- *address the recommendations of the Pacific Salmon Commission's Coded-Wire Tag Workgroup;*
- *provide information identified in RPA 62 of the 2008 FCRPS Biological Opinion explaining how coded-wire tag data helps:*
 - *inform our understanding of survival;*
 - *inform our understanding of straying;*
 - *inform harvest rates of hatchery fish by stock, rearing facility, release treatment, and location;*
- *evaluate the viability of replacing coded-wire tags with newer more efficient tagging techniques, including a transition plan to make these changes;*
- *consider the issues around the use of coded-wire tags in the context of all the tagging of all types of salmon and steelhead in the basin, including the continued review of the use of PIT and related tags described in the next issue below; and*
- *in collaboration with the Council staff and Bonneville, review the appropriate level of Fish and Wildlife Program participation and Bonneville funding of coded-wire tagging.*

Based on the plan and the ISRP review, the Council will then work with Bonneville and the tagging agencies to revise the coded-wire tag projects for the appropriate level of future funding. The Council may charter a formal facilitated workgroup consisting of coded-wire tag project sponsors and Council and Bonneville staff and others to address the need within the Fish and Wildlife Program for coded-wire tag information, a transition plan to

alternative, more reliable tagging technologies, and the appropriate level of Bonneville funding for this work.

Projects 1982-01-301, 1982-01-302, 1982-01-303 and 1982-01-304, all having to do with coded wire tags, included the following specific recommendations from the Council: *Implement through FY 2013 with condition: Sponsor to participate in developing an over- arching plan on the future of CWT as described in programmatic issue #9. Funding beyond 2013 subject to ISRP and Council review of the plan.*

During the Council's 2010 and 2011 review of all Research Monitoring Evaluation and Artificial Production projects¹ the Fish and Wildlife Committee requested staff develop a charter for a facilitated workgroup to address costs, efficiencies and gaps for all fish tagging efforts that take place under the Council's Fish and Wildlife Program, including expense, capital and reimbursable programs. The Council approved the Forum charter in its' regular July 2011 meeting.

Overview

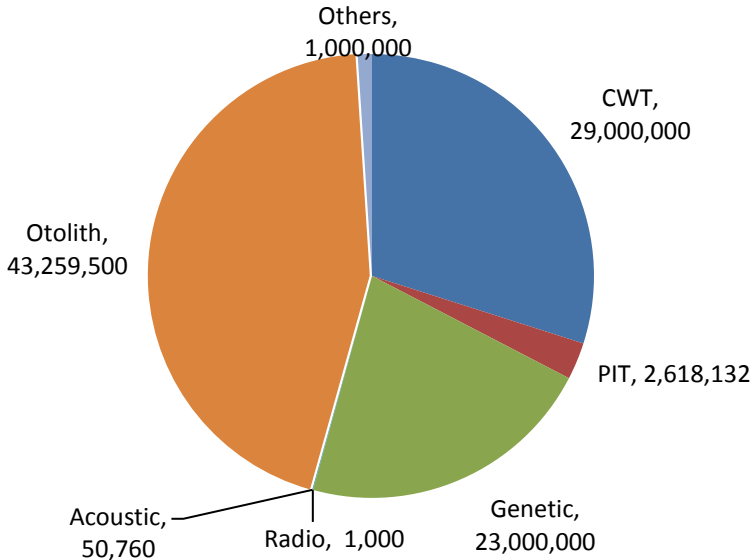
Overall there are few gaps and many overlaps in the tagging systems now in place. Overlapping efforts are not necessarily undesirable, as different tag technologies can often reinforce the level of confidence in results and are often used for multiple projects. In addition, some tag technologies have very specific and limited uses. Tagging coordination is generally well developed and successful throughout the Columbia River basin.

In Fiscal Year 2012 BPA spent over \$60,000,000 tagging or marking fish, detection of fish and analysis of fish tag data. In FY 2012 BPA funded more than 157 projects to carry out tagging, marking, detection or analysis of tag related data.

In 2012 in the Columbia Basin, approximately 200,000,000 tags of various types were applied to anadromous fish, sometimes more than one tag type per fish (see Figure 1). BPA funds a majority of the tagging either directly or indirectly, but other entities also fund fish tagging efforts, such as the Mid Columbia Public Utility Districts, federal and state agencies and Columbia River basin Indian Tribes, and investor owned utilities such as Idaho Power and PGE.

¹ Programmatic Issues # 9 (Coded-wire tags) and #10 (PIT tags and related tags) as part of the *RME and AP Category* review by the Council on June 11, 2011

Figure 1: Number of each tag type, not including adipose fin clips, applied during 2011 (or if available, 2012) in the Columbia River Basin.



Most of the fish tagging activity summarized in Figure 1 occurs within the anadromous fish migration and spawning areas of the Columbia and Snake Rivers (Figure 2.) The majority of the fish receiving a tag or mark are hatchery origin Chinook salmon.

Figure 2. PIT tagged fish release and recovery sites. These PIT tag related sites give a sense of the widespread distribution of all tagging activities in the Columbia River basin (Source: PTAGIS).

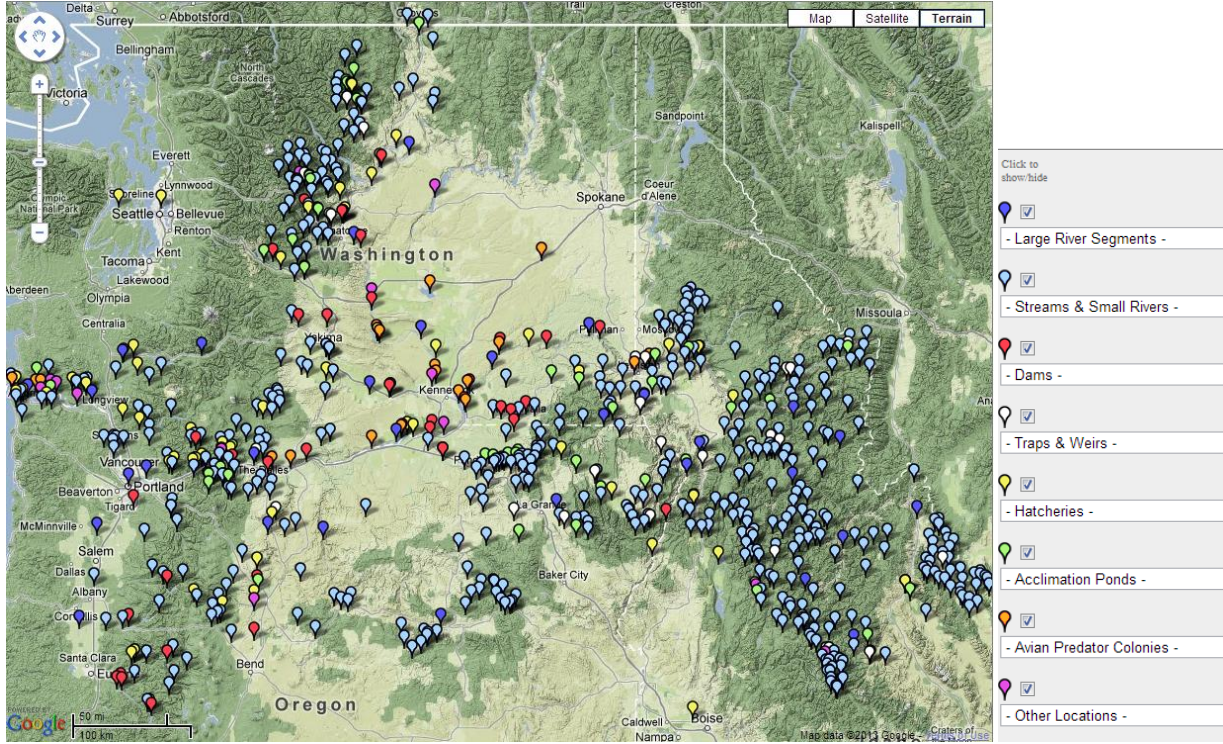


Table 1. Summary of the utility and characteristics of the most commonly used fish tags.

	PIT	CWT	Genetics	Acoustic/Radio	Special Use (Otolith and geochem)
Tag Use	Hydrosystem passage and survival, population status, habitat studies, predation studies and some hatchery studies. Distribution and in season run forecasting.	Stock survival, productivity and distribution. Fisheries composition and harvest rates. Hatchery analyses. Broodstock management.	Population status, some harvest, some habitat, relative reproductive success studies. Broodstock management	Hydrosystem route specific passage studies, some habitat studies, some population status studies	Life history studies, hatchery studies, migration timing, growth rates
Tag-related MortalityRisk	Low to moderate	low	low	high	low
Fish type (wild & hatchery)	Mostly hatchery, some wild populations	Mostly hatchery	PBT: hatchery only GSI: All fish	Mostly larger hatchery fish	Hatchery fish
Fish Size	>60mm	>50mm	Any	>110mm	Any
Geographic Coverage	Entire fresh water anadromous zones to blocked areas	Entire anadromous zone and ocean	GSI: Entire Columbia River Basin for all Steelhead and Chinook. PBT: Primarily Snake basin hatchery Steelhead and Chinook	Primarily at or near hydropower structures and associated reservoirs.	Entire anadromous zone and ocean
Duration of tag	Life of fish or until expulsion, may last long in sediments	Life of fish and some post mortality	Life of fish and some post mortality	Usually weeks, may be longer if low frequency (e.g., up to 1 to 4 years)	Life of fish to mortality

Management Questions and Indicators:

Nineteen key Management Questions and one hundred seventeen Indicators related to fish, mostly anadromous salmon and steelhead and supported by information gathered through fish tagging in the Columbia Basin were a principal element of the Forum’s assessment. Typically, a management question is answered through the use of a tagging program that quantifies the indicator. For example, a Hydro related *management question*, such as “*Are hydro passage conditions providing safe and effective passage for adults that contribute to meeting the performance standards and targets?*” may be partially informed by measuring an *indicator* such as “travel time” using PIT tags.

In addition to the technology focused presentations and discussions, the Forum members identified what Management Questions and Indicators are supported by the tagging efforts in the Basin. This understanding provides an important context for evaluating the tagging technologies

by capturing how information from each tagging technology is used to inform Columbia River Basin management questions and their indicators.

Not all the legal and policy drivers that give rise to tagging related Management Questions are of equal priority under the Council's Columbia River Basin Fish and Wildlife Program. The Council's responsibilities are primarily driven by the mitigation requirements of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act). The Northwest Power Act directs the Council to "protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries ...affected by the development, operation, and management of [hydropower projects] while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply." Under the Northwest Power Act, the Council's Fish and Wildlife Program is not intended to address all fish and wildlife problems from all sources.

Throughout the basin, NOAA's National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service are administering the Endangered Species Act, which requires information gathering, planning, and mitigation actions. The four northwest states and all of the Columbia Basin's Indian tribes also have fish and wildlife initiatives under way.

The Program is not intended to pre-empt the legal authorities of any of these parties. The Council's Program is designed to link to and accommodate the needs of other programs in the basin that affect fish and wildlife. Measures implementing this Program are funded primarily by Bonneville through revenues collected from electricity ratepayers. Although Bonneville has fish and wildlife responsibilities under the Endangered Species Act and the Northwest Power Act, both responsibilities can be met in the same set of actions. The Council will address both sets of responsibilities wherever feasible.

The Fish and Wildlife Program activities related to increasing the total adult salmon and steelhead runs in the Columbia River basin, particularly those that originate above Bonneville Dam, are intended to complement regional harvest agreements. Examples of those harvest agreements are the Columbia River Compact, the U.S. v Oregon Agreement and the Pacific Salmon Treaty.

The Management Questions and Indicators have been organized around the following categories: Hydro, Hatchery, Harvest, Habitat, Predation, and Species Recovery decision making. The Forum established a clear connection between management questions and tagging efforts, including instances when more than one tag technology is being, or can be, used to support decision making and instances when only one technology can gather the necessary information. For the purposes of conducting analyses and developing recommendations for the Council to consider, the management questions and associated indicators the Council has identified in previous decisions and in the Fish and Wildlife Program are helpful to focus the discussions within the broader context. Visual aids and spreadsheets have also been developed to document and communicate the relationships between questions, indicators, and tagging technologies.

Tagging Technologies: The Forum has received presentations from subject matter experts on the following tagging technologies:

- Acoustic Tags

- Passive Integrated Transponder (PIT) Tags
- Genetic Markers (PBT and GSI)
- Coded Wire Tags (CWT)
- Otolith Marks and Scales
- Fin Clipping
- Radiotelemetry Tags
- Data systems used to manage tagging data

For each technology, the Forum discussed the basic design, function and use of the tags; associated detection, recovery, and data management infrastructure; costs; relevance to specific management questions, application limitations, and potential for technological advancement.

The regions fish managers, action agencies and policy makers rely primarily on three long-term tags and one short-term tag to provide the majority of information needed to address management questions important under the Fish and Wildlife Program. These long term tags are PIT tags, coded wire tags (CWT) and genetic markers. Genetic Stock Identification techniques are increasingly being used to monitor wild salmon and steelhead populations throughout the Columbia River basin. Parentage Based Tagging primarily involves the genetic tagging of hatchery stocks and is most developed in the Snake River basin. The short term tag is an acoustic emitter and detection methodology primarily used by the US Army Corps of Engineers.

PIT Tags The number of PIT tags inserted into various species of fish in 2011 and 2012 appears in Table 2. The table provides insight into how the fish species and tagging mix varies somewhat from year to year, but can be viewed as relatively stable overall.

Table 2. Total number of PIT tag insertions for 2011 and 2012.

Year	2011	2012
Chinook	1,811,529	2,036,438
Steelhead	556,677	562,157
Coho	136,066	118,131
Sockeye	79,365	81,162
All others	32,484	12,663

Source: PTAGIS

Coded Wire Tags (CWT) CWT information is still coming in for 2012, but 2011 information of insertions by species is shown in Table 3.

Table 3. Total number of CWT, by species, inserted in 2011, for the Columbia Basin and Pacific region.

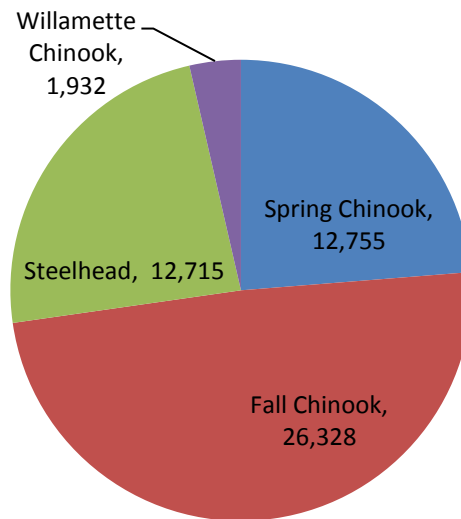
Species	Columbia Basin CWT	Other CWT	Total CTW
Chinook	23,383,741	28,352,968	51,736,709
Coho	3,592,384	4,777,031	8,369,415
Steelhead	2,616,073	329,135	2,945,208
Sockeye	415,567	25,548	441,115
TOTAL	30,007,765	33,484,682	63,492,447

Condensed from a table provided by: Dan Webb, Regional Mark Processing Center

The data in the above two tables (Table 2 and 3) show clearly that Chinook salmon is the species subject to the greatest amount of tagging with PIT or coded wire tags. The greater number of tags, and often higher tag rates, result in Chinook salmon being used more widely to inform management questions. Steelhead are not subject to commercial harvest in the ocean and thus are CWT'd less intensely than Chinook and coho, which are targeted by ocean salmon fisheries. The geographic distributions of species, ESA listings, and focus of Program projects drives a higher level of PIT tagging for steelhead than coho.

Acoustic Tags During 2012 a total of 53,730 acoustic tags were deployed by the US Army Corps of Engineers. Most of these tags were inserted into Chinook salmon. The purpose of these tags was to provide data for route specific dam survival studies. Of the total number of acoustically tagged fish in 2012, less than thirteen thousand were steelhead, and the remainder were Chinook salmon. Figure 3 shows the species and geographic mix of fish used for the acoustic tag studies.

Figure 3. Species and geographic distribution of acoustic tags in U.S. Army Corps of Engineers studies in 2012.



In the Mid-Columbia River, Grant and Chelan PUDs have used acoustic tags over the past decade to measure survival performances standards at dams and reservoirs of downstream migrating juvenile salmon and steelhead. In these studies, acoustic tags were used to monitor behavioral changes associated with modifications in dam operations and bypass structures to increase non-turbine passage efficiency and overall survival.

Radio Tags Additionally, radio tags have been used in the region to answer specific fish passage questions during a given life cycle phase, such as have ladder modifications increased upstream fish passage guidance and/or efficiency of adult salmon, steelhead, or lamprey at a given dam or a series of dams in the Columbia and/or Snake River basins. Radio tags are well suited for large-scale movement studies in freshwater and at shallow depths (less than 10 m). Acoustic tags are best suited for estuary based studies as radio signals cannot be detected in saline or brackish waters.

Genetic Tags For genetic tagging, GSI baselines have been completed for wild steelhead and Chinook salmon for the entire Columbia River basin, effectively tagging these species at the ESU or MPG level throughout their entire range in the basin. These baselines are used to report on the genetic diversity of these species throughout the CRB and to perform GSI at Bonneville and Lower Granite Dams to estimate VSP parameters associated with abundance and productivity of wild stocks. These baselines have also been used to estimate the stock composition of wild Chinook salmon and steelhead caught in the lower mainstem treaty fisheries.

Adequacy of geographic and species coverage.

Tag technology use is not evenly distributed throughout the Columbia basin (Tables 4, 5 and 6). The Forum was tasked to 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. We have summarized tables for the CWT, PIT, and genetic PBT tagging release data to examine geographic coverage, species, and life cycle monitoring

CWT For CWT there is a broad geographic and species coverage, but it is predominantly used for Chinook and coho, due to the existence of coast wide sampling programs for tag recovery. CWT tagging coverage is lacking for chum salmon because they are too small to tag with CWT and they are relatively rare in the Basin. Otolith marks are typically used instead for chum salmon. Sockeye and chum are not CWT'ed in large numbers because CWT sampling programs for them are very limited in general. Wild stocks such as wild steelhead are typically not CWT'ed because of the logistical difficulties. The other zeros in the table generally reflect the few populations, low abundance, or lack of CWT needed for harvest information.

Table 4. 2011 CWT releases by region and species.

Description	Region	Spring CK	Summer CK	Fall CK	Coho	Sockeye	Chum	S. Stlhd	W. Stlhd	Totals
Below Bonneville	L Col	1,998,146	NA	1,565,700	1,998,194	NA	0	0?	20,491	5,582,531
Bonneville - McNary	M Col	1,412,129	NA	3,192,336	208,684	0	NA	62,146	0	4,875,295
Snake R Basin	Snake	3,128,425	527,219	3,702,296	121,547	184,198	NA	2,019,140	NA	9,682,825
Above McNary	U Col	2,437,495	3,321,622	2,098,373	1,263,959	231,369	NA	514,296	NA	9,867,114
Totals:		8,976,195	3,848,841	10,558,705	3,592,384	415,567	0	2,595,582	20,491	30,007,765

PIT tags The PIT tagging data is presented in Table 5. There is relatively good representation of PIT tags in all geographic areas except below BON. Only 2% of the PIT tagged fish in the Columbia basin are released below BON. This is because the infrastructure needed to recover PIT tags is concentrated and most effective at mainstem Columbia River dams above BON. Therefore, unless PIT tag infrastructure is installed below BON, this technology will have limited application in this area. CWT will remain the most cost effective tag technology to answer management questions downstream of BON. However, our ability to answer some management questions will be less effective in this area without PIT tags.

Table 5. 2011 PIT tag releases by region and species.

Description	Region	Spring CK	Summer CK	Fall CK	Coho	Sockeye	Chum	S. Stlhd	W. Stlhd	Totals
Below Bonneville	L Col	33,574	NA	11,917	7,891	NA	0	0	4,083	57,465
Bonneville - McNary	M Col	120,325	NA	60,274	661	760	NA	44,768	6,222	233,010
Snake R Basin	Snake	391,091	148,049	656,956*	14,981	68,147	NA	329,520	NA	1,608,744
Above McNary	U Col	189,207	141,023	59,113	112,533	10,458	NA	172,084	NA	684,418
Totals:		734,197	289,072	788,260	136,066	79,365	0	546,372	10,305	2,583,637

* In FY 2013 PIT tagging of Snake River Fall Chinook has been reduced to 92,000.

Genetic Tagging Parentage Based Tagging technology is less developed throughout the CRB, with only one large basin (Snake) implementing 100% PBT tagging of steelhead and Chinook salmon hatchery stocks (Tables 6a and 6b). However, CRITFC began PBT sampling programs for all Chinook salmon and steelhead hatchery stocks above Bonneville Dam in 2011, and is planning to initiate PBT sampling of all hatchery stocks below Bonneville Dam in 2013.

The Snake River PBT baselines for Chinook salmon and steelhead are currently being used in conjunction with GSI baselines to estimate the stock composition of wild and hatchery Chinook salmon and steelhead caught in zones 1-10.

Table 6a. Number of steelhead hatchery broodstock sampled and successfully genotyped for PBT in the Snake River basin (2008 – 2011). Tagging rate, number of smolts produced and number PBT tagged.

	Spawn Year			
	2008	2009	2010	2011
Broodstock sampled	5,151	5,761	5,282	5,931
Genotyped	5,070	5,636	5,198	5,765
“Tagging” Rate of Offspring	96.9%	95.7%	96.9%	94.5%
Smolts Produced *	~9.01 mil	~10.08 mil	~9.24 mil	~10.38 mil
Smolts “Tagged”	~8.74 mil	~9.65 mil	~8.96 mil	~9.81 mil

Table 6b. Number of Chinook salmon hatchery broodstock sampled and successfully genotyped for PBT in the Snake River basin (2008 – 2011). Tagging rate, number of smolts produced and number PBT tagged.

	Spawn Year			
	2008	2009	2010	2011
Broodstock sampled	10,836	8,849	8,290	8,410
Genotyped	10,630	8,493	8,235	8,329
“Tagging” Rate of Offspring	96.2%	92.1%	98.7%	98.1%
Smolts Produced *	~19.0 mil	~15.5 mil	~14.5 mil	~14.7 mil
Smolts “Tagged”	~18.3 mil	~14.3 mil	~14.3 mil	~14.4 mil

Tagging Effects It is generally accepted that there are adverse affects from tagging. However, these affects vary greatly depending on the tag type, fish size and condition, biological and environmental factors, tagging procedures, etc. For ESA listed populations, NOAA issues

annual “take” permits to allow tagging and co-managers have permitting process for capture and tagging of non-listed fish.

Data Systems: The Regional Mark Information System (RMIS) is a database for coded-wire-tags (CWT). It stores CWT tagging, recovery, and sampling data. In addition, it stores fin mark data such as the mass mark data, and provides age data. The Passive Integrated Transponder (PIT) tag data is stored in PTAGIS. It stores tagging and recovery data along with biological data from individual fish. It does not store sampling data so to estimate abundance sampling data from other sources is used. For genetic markers there has been a switch from microsatellites to single nucleotide polymorphisms (SNPs). CRITFC and IDFG are working toward developing a publicly accessible SNPS data repository. An otolith marking data repository is kept by the Working Group on Salmon Marking of the North Pacific Anadromous Fish Commission. The goal is to coordinate otolith marking strategies between member countries (US, Canada, Russia, Japan, Korea) to decrease overlap in patterns and to facilitate an improvement in the method overall. Scale databases are maintained by management agencies.

Coordination: There is generally good tagging and tag recovery coordination within the various agencies and tribes. This coordination occurs for management decision or local coordination for population monitoring. The F&W program is primarily organized around subbasin plans and individual projects, which does not promote programmatic tagging coordination. However, from a cost-effective perspective increased programmatic coordination of both PIT and Acoustic tagging could be valuable. Examples could include the annual purchase of PIT tags, and linkage between tagging, recovery and reporting costs. Given the flexibility in answering multiple questions with PIT tags this may be a natural area to improve coordination, along with cost information.

Shared Infrastructure/Efficiencies: Tagging and recovery of salmon and steelhead tags to address multiple management questions benefits from the shared infrastructure of the Fish and Wildlife program. One example of the shared infrastructure to support multiple tag technologies is the current fishery sampling program. For example, fishery samplers collect biological data, genetic marker, CWT, and PIT tags, along with recover of radio and Floy tags. Another example of the shared infrastructure is PIT tagging juveniles to estimate trap efficiency for smolt abundance estimates. These PIT tagged fish are used by others to estimate juvenile and adult hydro-system reach survival, smolt to adult returns (SAR), bird predation rates, PIT tag based harvest estimates, etc. This opportunistic detection/recovery of PIT tags is considered a positive externality by economists, where the tagging costs by one entity benefits another party that did not incur this cost. In this case the benefits from the juvenile tagging at a smolt trap are a benefit to the entire Fish and Wildlife program. This may be considered as strength of the PIT tag or other tagging program, where multiple management questions may be answered by single tag technology. However, due to these positive externalities, care must be taken if tagging is restructured in the Fish and Wildlife program, because we have not linked all of the positive externalities in the program. For example, if there was a decision to stop PIT tagging juvenile salmon, we would not have bird predation estimates because they depend on juvenile PIT tagging by others.

Effectiveness Evaluation: Consistent with the Charter, the Forum considered effectiveness in terms of Program Effectiveness and Cost Effectiveness. The considerations for these

components of effectiveness are defined below, followed by a discussion of outcomes of the Forums evaluation.

Program Effectiveness: An assessment of how well the tag/mark serves the technical/decision-making needs associated with the Bonneville funded F&W Program. Primary considerations include:

1. Ability to support Management Questions and Indicators
2. Geographic Coverage
3. Species Diversity
4. Life Cycle Tracking
5. Reliability (e.g., tag loss and detection/recovery rate)
6. Biological Effectiveness (e.g., handling, tag/mark-related mortality)
7. Data Management and Coordination

Short versus Long-Term Applications: Fish tagging technology can be categorized as short- and long-term for the purposes of analyzing their utility. Radio and acoustic tags are primarily used in short-term (a few weeks) fish passage and migration studies as they are active tags relying on an internal battery to power either a coded radio signal or a coded sound pulse on a repeating, intermittent basis. After a period of time the batteries run down and the tag is no longer capable of transmitting a signal, e.g., not detectable.

Long-term tags last the lifetime of the fish, unless they are expelled somewhere along the way, which occasionally happens for a low percentage of fish. Long-term tags in common use in the Columbia River basin are PIT, CWT, otolith marks, and fin clips. Fish scales can also be used as tags to address some questions. Genetic markers, while not strictly a tag, function very much like a tag to identify fish at various levels of resolution (ESU, population, hatchery, off spring). Genetic stock identification (GSI) is increasing in use in the CRB and allows determining the stock of origin of a fish. When genetic data on adult spawners are available then the use of Parental Based Tagging (PBT) can identify the origin of a fish.

Support of Management Questions and Indicators: The Forum has also identified which tags are considered Not Applicable, Primary, Secondary, Specialized Use or Future use technology to answer a specific management question and the consequences of not having specific tag types available to support decision making (REF Indicator Analysis Spreadsheets/Spider Chart).

The majority of the 117 indicators of interest can be informed through tagging technologies. Nearly all of the indicators are monitored with multiple tag technologies. Multiple tags to assess indicators or even within a single fish are not necessarily considered redundant. Often multiple tags serve to validate information or serve different purposes. Some indicators are only currently monitored with one tag type, although some other tag types could be used in the future if adjustments are made. For instance, ocean harvest indicators could be monitored by either Coded Wire Tags (CWT) or through genetics, but as a Pacific Salmon Treaty condition, only CWT are currently being used for monitoring treaty compliance.

For instance, the CWT system is currently the only methodology available to produce estimates of stock and age specific ocean fishery mortality that are required to determine survival, recruitment and productivity of each stock, partly because there is no coast wide sampling

program for any other tag types, like PIT tags or genetic samples. In the future, investments could be made to implement a coast wide genetic sampling and data management system similar to that for CWT, and genetic methods could be used to obtain stock composition of ocean harvests. However, GSI alone does not provide the age-specific estimates required, and PBT is applicable only for genetically "marked" fish (such as from hatcheries), so it is likely both would have to be implemented in conjunction with each other.

Cost Effectiveness: An assessment of how the relative life-cycle costs of tagging/marketing technologies (from application to detection/recovery and associated data management) compare when addressing similar management questions or indicators. Considerations include:

1. proportion of technology/infrastructure investment versus labor investment,
2. least-cost data collection strategies,
3. coordination/consistency on methods and data reporting.

Annual Cost Benchmark: For the purposes of estimating costs, direct, indirect and reimbursable costs to BPA are included. BPA and US Army Corps of Engineers staff have estimated cost-related information for each tagging technology that includes all activities, including tag insertion costs, tag detection costs and analysis of data generated from the tags. The estimated tagging costs in FY2012, shown in Table 7, below, are considered generally accurate, though not precise. Acoustic tag costs will vary quite a bit from year to year depending on how many US Army Corps of Engineers dam passage performance standard studies in Columbia/Snake River or Willamette Basin studies need to be conducted. BPA costs include direct costs, indirect costs and reimbursable costs (Table 8).

Table 7. BPA’s best estimate of all BPA funded 2012 tagging costs for insertion, detection and analysis of the tagging data.

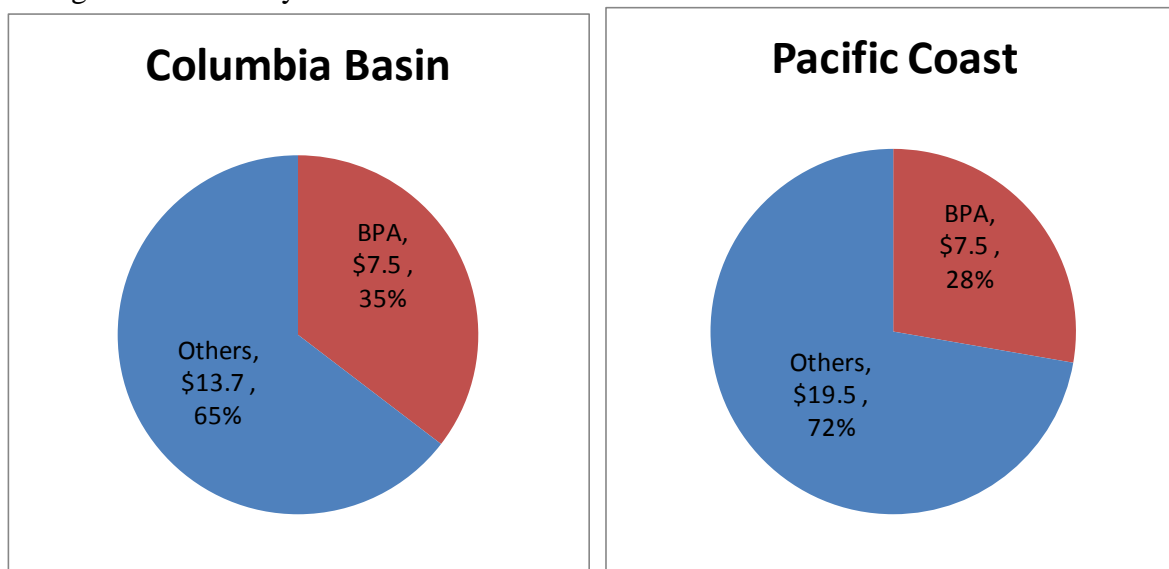
Tag Technology	Bonneville Cost	
CWT	\$ 7,500,000	
PIT	\$ 23,800,000	
Genetic	\$ 7,800,000	Only \$5.5 Million is strictly genetic tagging
Radio	\$ 2,100,000	
Acoustic	\$ 18,500,000	Varies significantly year to year
Others	\$ 1,700,000	
Total	\$ 61,400,000	

Table 8. BPA’s best estimate of all BPA funded 2012 tagging costs for insertion, detection and analysis of the tagging data for direct, indirect and reimbursable costs.

Funding Source	Tag Technology						TOTALS
	CWT	PIT	Genetic	Radio	Acoustic	Other	
Fish & Wildlife Program	\$5,434,900	\$18,219,745	\$7,780,782	\$1,897,782	\$951,585	\$1,474,317	\$35,759,111
LSRCP	\$1,218,287	\$1,909,000					\$3,127,287
COE	\$858,903	\$3,663,546		\$234,600	\$17,559,502	\$219,000	\$22,535,551
TOTALS	\$7,512,090	\$23,792,291	\$7,780,782	\$2,132,440	\$18,511,087	\$1,693,317	\$61,422,007

CWT - Cost Share. There are limitations in available data that make it difficult to precisely estimate the CWT cost share. The Forum considers these estimates to be a reasonable representation. The current CWT program is about \$21.2M, with the BPA cost share to \$7.5M or approximately 35% of the funding for the CWT tagging and recovery program. The remaining \$13.7M of the CWT program is funded by others. This represents a minimum because CWT data analysis cost from co-managers were not included.

Figure 4. BPA estimated funding for CWT tagging, recovery and data management for salmon and steelhead fisheries, compared to other agencies’ funding for only CWT tagging and recovery. There are additional substantial expenditures by other agencies on CWT data management and analysis that are not included above.



For species sampled for CWT in ocean fisheries, the tag recovery rates, taken in proper context, can provide additional insight into information returns resulting from investments in tagging technology. The following Table 9, shows ocean recoveries of CWT in Columbia River origin fish. Steelhead, sockeye and chum recoveries are very low due to lack of sampling and because chum are not CWT'd.

Table 9. Ocean CWT Recoveries

Year	Chinook	Coho	Sockeye	Chum*	Steelhead	Totals
2011	6,958	2,577	1	0	4	9,540
2010	8,832	1,472	0	0	1	10,305
2009	5,364	4,364	2	0	9	9,739
2008	4,941	692	2	0	7	5,642
2007	4,502	2,763	4	0	1	7,270
Totals:	30,597	11,868	9	0	22	42,496

*Chum are generally not CWT due to small size

A similar analysis for PIT tags may not yield meaningful information. For example in 2011 about 2.8 million fish were PIT tagged in the Columbia basin. Of those tagged fish over 1.1 million survived release to be detected somewhere else. The total number of detections of these 1.1 million fish exceeded 15 million. While these numbers may be interesting they do not reflect the utility of the detections. For example, if a group of fish was PIT tagged for the purpose of calculating SAR from Lower Granite Dam juvenile to Lower Granite Dam adult, then the many in between tag detections, while interesting, do not help inform the LGR to LGR SAR.

Cost-Effectiveness Modeling Tool: The Independent Economic Analysis Board (IEAB) explored the use of a linear programming model to assist the Forum in structuring the cost-effectiveness evaluation. This analytical tool was informed by the Forum process, but not available at the time the Forum developed the recommendations provided below.

Emerging technology, particularly the future use of genetics

GSI can be used to determine origin and stock composition of mixed samples of both wild and hatchery fish, but not by age, while PBT can provide fish origin by age, but only for genetically "tagged" fish." PBT can identify the origin of a fish only if at least one of its parents were genetically sampled ("tagged"), and is therefore most practicable for identifying hatchery fish. Therefore, PBT and GSI are most effectively applied together to assign individual fish (hatchery or wild) to stock of origin.

For GSI, there have been rapid advancements in the development of single nucleotide polymorphism (SNP) genetic baselines for Chinook salmon, steelhead and sockeye salmon

throughout the entire Columbia River basin (projects 2008-907-00 and 2010-026-00). These baselines, along with non-lethal sampling programs at Bonneville Dam and Lower Granite Dam are increasingly being used to report on the VSP parameters of diversity and abundance of wild stocks as they migrate from the ocean back to native spawning areas in the basin. Genetic Stock Identification appears to be the only technology that can “tag” wild salmon and steelhead at the ESU or MPG level across the entire Columbia River basin and allow non-lethal tag “recovery” through their entire life-cycle.

A genetic sampling and genotyping program for Chinook salmon has been in place for the mainstem Columbia River fisheries (zones 1-10) since 2009 (CRITFC; 2008-907-00). A similar pilot program was initiated in 2011 for steelhead (IDFG & CRITFC). Recently, both of these programs have been able to demonstrate the benefit of integrating Parentage Based Tagging (PBT) technology for hatchery stock assessment. Parentage Based Tagging is an emerging technology for permanently genetically tagging hatchery stocks of steelhead and Chinook salmon and it has the potential of addressing many of the same management questions currently being addressed with CWTs in the Columbia River basin. Some of the primary advantages of PBT include: low per sample tagging costs, no tag related mortality, non-lethal recovery of tags, and the ability to address data needs associated with measuring genetic diversity, effective population size and relative reproductive success. At the time of this review, the Snake River basin is the only large basin that has initiated 100% PBT sampling and genotyping of steelhead and Chinook hatchery broodstock (2010-031-00), and thus only Snake River hatchery stocks can be identified via PBT when sampling lower mainstem CRB fisheries. CRITFC has initiated the sampling of all Chinook salmon and steelhead hatcheries in the CRB in anticipation of extending PBT technology outside the Snake River.

PST funding has been used to develop the coast wide microsatellite baseline for Chinook, improve baseline genetic samples and further develop SNPs and analytical methods for using genetic data. However, the use of GSI and PBT coast wide requires development of the rest of the "system", including a coast wide genetic sampling system, increased lab capacity, analytical tools to turn the data into useable information, standards for data sharing, and database systems.

Fish Tagging Forum Recommendations

The Fish Tagging Forum (Forum) made final recommendations to the Council, which were presented to the Fish and Wildlife Committee at the May 7, 2013 committee meeting in Boardman, Oregon. The Forum’s recommendations (see Attachment) cover several tag types. The following recommendations, with near-term, mid-term or long-term time frames for implementation are presented as the Forum’s consensus, unless presented as alternatives for those few recommendations that do not have the Forum’s consensus. A near term recommendation is meant to be implemented immediately after the Council adopts the recommendation. Mid-term recommendations are meant to be implemented over the next year. Long-term recommendations are designed to be implemented over three to five years to allow implementers time to adjust to the effects of the recommendations.

Table - Consensus recommendations of the Fish Tagging Forum

	Type	Forum Consensus Recommendations	Timeframe
1	Global	Any reduction in funding associated with the recommendations would be available for redirection to other F&W projects.	Near term
2	Global	NOAA to provide guidance in coordination with state, tribal, and other researchers/experts regarding best practices for tagging ESA-listed salmonids.	Mid-term
3	PIT	Implement an annual PIT tag coordination and review forum including federal, state, tribal, utility representatives and other entities for both fish and wildlife projects with the purpose of reviewing short-term and long-term study plans relying on the use of PIT tags to; <ul style="list-style-type: none"> i - Evaluate opportunities to increase efficiency of tag use in a way that minimizes costs and reduces the number of fish tagged; and ii - Provide input and review of the PIT tag forecasting system for the purchase of PIT tags in the Columbia Basin 	Near term
4	PIT	Council sponsor periodic subject matter expert evaluations of rates of PIT tag loss and effects of tagging on fish behavior and survival throughout the life cycle to understand how it affects confidence in critical parameters derived from PIT tag studies.	Long term
5	PIT	Council utilize the IEAB and ISAB to work together with interested regional partners to develop an analytical tool to evaluate trade-offs between PIT tagging levels, detector arrangements and the accuracy and precision of parameters used in making priority management decisions.	Long term
6	PIT	At the completion of the current PIT tag harvest monitoring project (2010-036-00), the Council and ISRP should follow a deliberate and measured approach to evaluate the project.	Long term
7	CWT	Eliminate routine coded wire tagging of steelhead and sockeye because they are not sampled in the ocean at levels significant enough to influence decision making. However, some coded wire tagging of these species will be necessary for specific research projects and hatchery operations and evaluations.	Long term
8	Genetic	Funding of on-going FWP projects developing and evaluating genetic methods (GSI and PBT) should continue consistent with the projects' goals and objectives. After 5-10 years of monitoring have been completed the effectiveness and efficiency of the genetic methods should be evaluated for broader application. The funding of new projects within the FWP should follow a deliberate and measured approach to consider how those new projects would complement existing projects.	Long term
9	Acoustic	Recommends twenty or more year interval between JSATS studies at USACE operated dam(s) unless major modifications to the structures or operations at the dams require updated information about fish survival at the dam(s). Furthermore, before future JSATS studies are implemented the Corps of Engineers, in collaboration with NOAA Fisheries and the Council, should evaluate whether existing, less expensive, tag technologies could be used and if acoustic tags are the appropriate technology for the research objectives, then what is the appropriate data collection required (i.e., presence/absence, two-dimensional or 2D, or three-dimensional or 3D, which provides depth information), to provide adequate information to assess juvenile survival at the dam(s) at a lower cost.	Near term
10	Acoustic	Within one year of date of this recommendation The Corps of Engineers in consultation with NOAA should develop a long term 20 year plan for acoustic tag studies within the Columbia and Willamette River basins. This plan should include the purpose of studies, coordination planning to be done with other entities that may be using acoustic tags, locations of the studies, study dates and estimated costs for acoustic tag studies that are envisioned over the next 20 years. This plan should be shared with the Council and the region for comment.	Mid-term
11	Acoustic	Council should sponsor a public review of the USACE 2014 to 2018 forecast for JSATs performance testing cost and schedule for potential additional efficiencies	Near term

		and associated cost savings.	
12	Radio	Council should continue to support the use of radio tags for specialized purposes to meet the evaluation criteria for specific research objectives and should continue to be used when appropriate for short-term study designs.	Near term
13	Data	Extend PERC process to evaluate potential improvements in the PIT tag and CWT regional databases (PTAGIS and RMIS) that provide important data sharing and analysis, leading to good decision making for our shared salmon resource on the Pacific Coast.	Mid term
14	Data	Implement a regional SNPs genetics database at PSMFC that can be shared in the same manner as the current PTAGIS and RMIS databases.	Underway
15	Data	Link the PTAGIS, RMIS, and SNPs databases to bring more power to these databases, leading to easier and more complete regional mark/tag data analysis (i.e. linking fish with multiple marks or tag in these databases).	Underway
15	Data	Through BPA contracting procedures, provide better documentation of tagging protocols through MonitoringMethods.org.	Near term
17	Data	Evaluate the costs and benefits of incorporating tag-related cost-tracking components into future upgrades to PISCES, and CBfish.Org	Long term

Forum Non-consensus Recommendation

The Forum could not reach a consensus recommendation on the funding responsibility for all Coded Wire Tag (CWT) uses, therefore alternatives have been identified for funding CWT activities. The proponents for each alternative did present their thoughts on merits and consequences of each alternative to the F&W Committee and Council directly and/or in writing.

- i. Alternative 1: Maintain status quo funding [\$7.5 million]
- ii. Alternative 2: Over 3 year transition period, reduce BPA funding for fishery catch sampling and associated analysis [Eliminates \$1.9 million in annual project funding]². <http://www.nwcouncil.org/media/6827185/CWT-cost-spreadhseet-by-Bonneville-4-8-13-related-to-recommendation-1b.xlsx>
- iii. Alternative 3: Over a 3 year period, reduce BPA funding for tagging at Mitchell Act Hatcheries [Funding reduction of \$0.6 million]³
- iv. Alternative 4: Increase CWT funding, if necessary, to achieve CWT program objectives (e.g., desired sampling rate at 20%. Cost is uncertain.)

Council Recommendations to Bonneville

At its regular August 7, 2013 meeting the Council voted by a six to two majority to support all of the Forum’s seventeen consensus recommendations and to support alternative 1 of the Forum’s non-consensus recommendation with the following principles and conditions:

1. The Council concludes that the use of Bonneville funds for CWT is not obviously outside Bonneville’s spending authority under the Northwest Power Act, nor is it a clear violation of the “in lieu” provisions of the Act. Rather, in a situation of overlapping authorities, the question is whether the level of Bonneville funding for coded wire tagging is out of proportion with what could be considered Bonneville’s ‘fair share’ of the coded wire tagging

² These recommendations do not apply to projects funded under the fish and wildlife accords.

program, based on the amount of information gleaned from the tags that is relevant to the Council's program. This is a policy within the purview of the Council as well as Bonneville.

2. Fish managers rely on CWT as a primary indicator for many management questions, including population status and recovery of endangered species. The Council and Bonneville rely on the fish managers to help develop the Fish and Wildlife Program and to provide Program implementation expertise.
3. The ISAB and ISRP have both endorsed the use of CWT (2009 reports).
4. The IEAB reports that there are inefficiencies in tagging programs across the board. The preliminary fish tagging economic model development reported by the IEAB (June, 2013) indicates this concept is worth further development into a tool by Bonneville. The Council recommends Bonneville, in collaboration with NOAA, the Council, fish managers and appropriate others, develop a Request For Proposals to further refine the tagging model developed by the IEAB, or a similar model, and fund the development of that model to facilitate regional collaborative decision-making regarding programmatic and cost efficiencies in the fish tagging programs funded by Bonneville. The model should be operational in two years.
5. Encouraging efficiency in existing tagging programs and reducing costs in favor of more efficient tagging methods is a goal endorsed by the Council and recommended to Bonneville.
6. A centralized, integrated process that includes evaluating program priorities, as well as costs could play a highly beneficial role in a rationalization process that would improve both cost and program effectiveness of fish tagging (IEAB, June 2013).
7. Implement alternative 1 of the non-consensus recommendation, until the results of conditions 4 and 6 provide a rational alternative that is supported by the Council.
8. The Council recommends that Bonneville and the managers report annually on the number of juvenile fish released each year, and the subsequent number of adults that contribute to harvest, broodstock, and the spawning grounds for all hatchery programs receiving Bonneville funding. Provide this information annually for each hatchery by stock and brood year. The first report should be submitted by December 2013.
9. Regardless of the above conditions, the Council may adjust its recommendations to Bonneville regarding fish tagging as new information regarding technological improvements, efficiencies or tagging opportunities become known.

Five members of the Council requested their statements be included in the record as provided in the Act and Council by-laws. Those statements, attached below, have been edited slightly for clarity.

Sincerely,

Signed TG/ 8/20/2013

Tony Grover
Director, Fish and Wildlife Division

cc: Elliot Mainzer, BPA
Lorri Bodi, BPA
Marcy Foster, BPA

Attachment:

Statements of Council Members regarding the following motion:

That the Council recommend that Bonneville and others implement the 17 consensus recommendations from the Fish Tagging Forum, and that Bonneville continue to provide funding for the coded-wire tagging activities (that is, alternative number 1 from the Forum), conditioned by and consistent with the nine principles stated in the July 30, 2013, decision memorandum presented by staff.

[Council vote on motion: passed 6-2 on a roll call vote. Members Yost and Booth voted no.]

Phil Rockefeller, Washington, Chair, Fish and Wildlife Committee

I would like speak in support of the motion. First I think I will touch lightly on the fact that the commendable work of the Forum did yield 17 consensus recommendations, which received unanimous support of the Fish Tagging Forum members and I believe are widely supported by the Council members as well. It would be easy to slide over this and ignore the fact that those are important recommendations, they are on display up there [referring to powerpoint], they touch on several areas of tagging as well as data management, and there are some generic recommendations, as well. Those in the aggregate will require some follow through, and there will be significant follow-through work required of the Council and Bonneville and other entities in order to capture the benefits of those recommendations.

One of those recommendations does address coded-wire tagging. It's number seven right there. And there was a consensus on the appropriateness of eliminating coded-wire tagging for steelhead and sockeye. And so that in itself will generate a savings in the order of several hundreds of thousands of dollars. I can't be more precise in that because we don't know precisely what that cost is, but that's the range.

So that's all to the good. Unfortunately, after 18 months of effort the members of the Forum were not able to come to agreement on other recommendations relating to the coded wire tag issue. It was an issue that was brought up front and center, and so they deliberated it for a long time, and they eventually divided and the customer representatives, some of whom we heard today, put forward their views, which are alternatives two and three, and the fish agencies and the tribal representatives put forward alternative number one, and I believe NOAA at various times spoke in a manner which suggested that they were not entirely comfortable with alternatives two or three and were worried about possibly jeopardizing the work of the BiOp. And so we the Council ultimately have been asked to deal with a hot potato. They weren't able to get there but they are asking us to try to figure this out. Ultimately we have to make a decision, and as Bo Downen suggested, when you make decisions ultimately not everybody is always going to be happy. So that is the accountability that we have and the responsibility that we have.

For 32 years coded wire tagging has been a collaborative effort supporting the implementation of the Council's fish and wildlife program from the very beginning. It's been a core element of the implementation of that program. It serves not only the Council's needs and interests in terms of the fish and wildlife program, but it also serves the management needs of an array of other organizations and entities including tribal, state and federal. During that time Bonneville to date has been a reliable participant in helping to underwrite the deployment and operation of coded wire tagging including

the recovery and processing of the data that we derive from that, which serves a variety of interests and needs.

One might ask, well, what is Bonneville's historic share of the costs of underwriting this program? And the answer currently is that for the river it is roughly 35 percent. If you take a broader lens and look at the coastal coded-wire tagging activities at large it drops to about 28 percent. Those numbers may actually overstate the percentage slightly because there are other areas of activity that contribute to coded wire tags but those contributions were not calculated in the pie chart that yielded the 35 percent and the 28 percent numbers. But nonetheless it's a significant part of it, and Bonneville has been a reliable party. The data users include Bonneville, NOAA, the Columbia River tribes, the states and other entities as well. It should be pointed out, or we should remind ourselves, this data is also vitally important to the federal court, which has continuing jurisdiction over the Federal Columbia River Power System Biological Opinion. And it supports many of the issues that could arise there, especially with reference to RPA number 62. And I would take note that the Council and its fish and wildlife program partners also rely heavily on this data.

When you look to the program itself, our current program, for reference you might wish to look at pages 8, and 19, and 20. The program clearly calls for the evaluation of hatchery production and harvest actions. The Council calls for the information from tags to tell us if our hatcheries are operated in a manner to provide benefits for weaker stocks. We need that information to provide information on straying. We need it to determine whether there is an excessive take of weaker stocks in mixed-stock fisheries. We need that information on stock-specific abundance, escapement, catch and age distribution for both in-river and ocean fisheries. We look at it in terms of how fish are provided for harvest, what those opportunities are, and whether the harvest is being conducted in a way consistent with the protection and recovery of the naturally producing populations which are part of our mission and mandate to protect and enhance. So there is clearly an argument to be made that there is, in fact, a nexus.

Now, the coded wire tagging infrastructure itself supports other tagging activities as well, and that has been pointed out to us. That provides boots on the ground, if you will, to recover PIT tags and other biological information such as age composition, which is utilized for run reconstruction, which also links into RPA 62. That is an important part. Three of the Council's high-level indicators are dependent on the coded-wire tag program: Columbia River run data, harvest rates for Snake River fall Chinook salmon, and harvest rates of Snake River sockeye salmon. Without estimation of these runs it would not be possible for us to deliver on those indicators.

Now, Mr. Chair, the Fish Tagging Forum, after 18 months, as I noted earlier, divided on the issue of what should be the future role of Bonneville. And there were those who argued that there were both nexus and in-lieu issues under the Power Act. We took those concerns very seriously in the Fish and Wildlife committee and in our deliberations on this issue. We did not ignore them, because we regard them as threshold questions. If in fact you have a nexus problem, or lack of nexus, to more precise, or if there is an in-lieu issue where the funding from Bonneville is supplanting or replacing funding that should be provided or has been provided by others, in my opinion that would be "game over". There would be no need for us to look further down the path at what would be a fair share because legally there would be no basis for Bonneville to fund, even though it has done so for 32 years. In effect, we would say Bonneville would have to confess that it made a mistake for the last three decades and it's time to move on.

Before we were prepared to go that route we thought that since these are legal issues let's get the legal advice of our counsel on this matter. And you see in the briefing materials that are prepared and

provided by Tony the legal issues are discussed on Page 4 of his memorandum and the conclusions are also there. Those are basically a restatement of information that was provided to us by our counsel. In essence it finds that Bonneville's financial support falls within the terms of the Power Act. That is to say: there is nexus. And BPA support is not - based on any evidence that we saw presented to the Fish Tagging Forum - in lieu of other entities' expenditures, but rather, in addition to those expenditures. The point being, if you follow that analysis, it ultimately is a policy question which the Council is being asked to answer, and namely, is it appropriate, and to what degree do we believe Bonneville should continue to engage in support for fish-tagging activities that require coded-wire tags to be used and deployed extensively?

Summing all that up, the committee said we tried to answer the question, do we want to try to maintain a reliable and dependable coded wire tag capability where everyone, including Bonneville, pays an equitable share while we collaborate to build a more effective and efficient system of tagging. If you look at our recommendations and the principles, you will see that number seven says, 'implement alternative one of the non-consensus recommendations.' And that is the one that calls for maintenance of the current level of effort at \$7.5 million. But it is not a time-immemorial, endless recommendation. It is in fact a limited recommendation. It says, 'implement it until the results of conditions four and six provide a rational alternative.' In other words, we're saying status quo is not necessarily the ultimate answer or the desirable outcome, especially when we recognize there may be a better way to design and carry out tagging activities overall. If you recall, the IEAB, close to the end of the 18-month work period of the tagging forum, came forward with a recommendation for a modeling of a different kind of system that could be both program-effective and cost-effective. And they did a proof-of-concept of that, and they said if you implement this kind of a modeling which requires a different way of going about the process with more coordination, it would be a more centralized process, and in place of the one we that have now, which is more random, you would probably have a far more efficient system, and there you will find significant savings. That appealed to those of us on the committee. We only wish that that report had been available to the Fish Tagging Forum in the early days. It came along rather late in that process, to be sure. But it is there, and we're asking that work on that continue, and that's why we have the reference when we refer to status-quo funding, we're saying only until or unless we can develop a better system, following the ideas presented to us by the IEAB.

So that's at the core of our recommendation. This is not an endless recommendation, without consequences or without changes. So I commend this to the Council, and I appreciate the chance to speak in support of this motion. Thank you, Mr. Chair.

Tom Karier, Washington

I am focused on one aspect of this, which is primarily about the potential value of the information from coded wire tags. I think it's been referred to in the program -- the program does talk about this. But I think the bigger context is that one of the largest areas of expenditures by Bonneville is on hatcheries. Habitat is probably first, but second would be hatcheries, and it's probably in the range of about \$88 million a year on hatcheries. One of the major purposes of these hatcheries is to provide harvest opportunities and replace harvest opportunities that were lost to the tribes, to sports fishermen and commercial fishermen because of the impacts of the hydropower system. So it has a direct mitigation value.

But that value of harvest opportunities is only provided if harvest is conducted, and if the fish survive to that point. So in order to evaluate a major mitigation expenditure you have to evaluate harvest. I've heard some arguments that harvest is not the business of the power system. I don't see how it's not. You'd have to rewrite the Power Act and the fish and wildlife program to take harvest and those hatcheries out of it to make that case. So I don't think that's true. I think it is part of it.

The program says something to the effect, that a hatchery that rears fish solely for harvest is of little benefit if the majority of those fish go uncaught or if they don't survive. And they could go uncaught because there are restrictions on ESA that shut down the harvest before they get there. So there's a lot of reasons to want to know what happens to these fish once we release them as juvenile fish. We want to know if they are harvested or if they are not. It's a basic performance measure of a large investment of \$88 million.

I'd like to know what those are. I'd like to know what the harvest is per hatchery. Bonneville funds 15 to 20 hatcheries to do this kind of thing. I've been asking for years to get this information. It's collected through the coded wire tag program, but it's not reported. It's hard to get. I've been able to find it from one hatchery operator, but not the other 15 or 20.

If there is some negligence here I think it's that we haven't really collected the information, and so I point out principle number eight: that the Council recommends that Bonneville and the managers report annually on the number of juvenile fish caught each year and the subsequent number of adults that contribute to harvest, broodstock, and the spawning grounds from all hatcheries receiving Bonneville funding. The reason that's in there is because that's not happening now.

We're paying millions of dollars for that information, and somewhere between Bonneville and the managers the ball gets dropped and we don't get the information. I tend to think if we had that information right now that we could see what the hatcheries are contributing to the program, we'd have a different debate today. We'd still want to fine-tune this; we'd want to look for efficiencies, and there are probably some to be found here, but the basic information really needs to be collected. No matter what happens, I hope Bonneville pays attention to that principle. Thanks.

Jennifer Anders, Montana, Council Vice-Chair

I just wanted to make an observation, perhaps more about process than about substance. During this process, which was deliberated very seriously, I think, by all of us, we were not provided with any scientific basis on which we could reach a contrary conclusion to that that was presented to us by the fish and wildlife managers, to whom we defer in terms of how best to manage these systems. Nor were we presented with any alternative funding solutions that would give us assurances we need to make a decision based on valid scientific information.

In contrast to that situation, we were hearing from the scientists that coded wire tagging is an important and valid scientific tool for a variety of reasons. And as a matter of policy this committee has concluded that those reasons have a sufficient nexus to the work we do to justify funding for coded wire tagging, at least until there is some way to get that information from another source or in a more efficient manner. Under those circumstances, I don't believe I had any other choice, while I support cost savings and efficient data collection, I just cannot make those cuts at the expense of information that at least for the time being helps us understand what's working in the system and what's not. And those are my comments.

Statement of Council Members William B. Booth and James A. Yost of Idaho to accompany the decision of the Northwest Power and Conservation Council on the Council's Fish Tagging Forum's Recommendations, August 7, 2013

We appreciate the diligent efforts of the Fish Tagging Forum and thank its members for the many hours dedicated to this difficult task. Because of their methodical and detailed work, the Council, the region and the Bonneville Power Administration now have a much clearer picture of both the diverse functions served by a multitude of coded wire tagging projects, and the costs associated with the Columbia Basin's \$35,700,000 fish tagging effort.

Section 4(h)(5) of the Northwest Electric Power and Conservation Act mandates that the Fish and Wildlife Program shall consist of measures to protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of the hydroelectric system, while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply. This provides a clear directive from which BPA's funding decisions are to be made.

Having helped establish the Fish Tagging Forum and participated in its meetings, we know the Forum's findings highlighted commitments and costs that prior to the Forum's effort were largely not understood. Given this new information and a complete picture of the resources and responsibilities required to sustain the world's largest fish tagging program, BPA is now in a position to reevaluate its ongoing fish tagging projects, and we believe it should do so.

As it reviews FCRPS nexus relating to its tagging projects, we believe BPA should follow the directives of the NW Power Act, especially including Section 4(h)(10)(A), wherein the Administrator is directed to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries in a manner consistent with the program adopted by the Council and the purposes of the Act. Importantly, the Administrator is further directed to ensure that such expenditures shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law.

In view of the above mandate, and because Section 4(h)(10)(A) is a direction to the BPA Administrator, it is our opinion that BPA should; (1) carefully review the record and findings of the Council's Fish Tagging Forum, (2) determine where any of the tagging efforts are inconsistent with the provisions of the NW Power Act, and (3) phase out funding for projects that lack an FCRPS nexus or are in lieu of funds that should have been provided by other entities, such as Mitchell Act Hatchery fish tagging and other harvest management tagging.

Signed WB/ 8/7/2013

Signed JY/ 8/7/2013

William B. Booth

James A. Yost