

Fish Tagging Forum
March 22, 2012
Portland, OR

Draft Meeting Notes

Background

The Northwest Power and Conservation Council convened the Fish Tagging Forum (FTF) to address regional fish tagging issues (see [July 13, 2011 Charter](#)).

Notes from all meetings are available at the FTF [Past Meetings](#) page.

See [List of Attendees](#). The agenda and other materials presented, developed or modified during the meeting are available on the [Past Meetings](#) page.

Discussion Summary

1. Report Back from Management Question Subcommittee
 - Pat Frazier (WDFW) provided a summary of the task and progress made by the subcommittee. The subcommittee was tasked with reviewing management questions and associated indicators that will be used as part of the Forum's overall Evaluation Framework. The subcommittee reviewed the management questions and indicators drafted by WDFW for consideration and the comments submitted in-advance of the meeting.
 - Pat Frazier described the content and organization of the [Excel spreadsheet](#) of management questions and indicators:
 - o There is a separate tab for 6 broad topics of management questions, specifically: Hydro, Harvest, Hatchery, Habitat, Predation, and Population Status Recovery.
 - o For each Tab, there are columns listing:
 - Column A: numbered management questions related to the broad topic. In some cases there is additional text below the question to provide a description of subtopics that should be considered as part of that question.
 - Column B: indicators that inform that specific management question.
 - Columns D to K: list the various forums that may be interested in or inform the management question listed under Column A.
 - Columns M to O: are the various tag types that may be used to collect data used to inform the indicators listed under Column B.
 - o The intent is to eventually indicate which management questions (column A) inform which forum (columns D – K), with the possibility of a single management question informing multiple forums. The indicators (column B) will be associated with the tagging technology (column M to O) that can produce the information, with multiple tag types potentially being linked to the same indicator.

- Pat Frazier summarized the changes the subcommittee made from the original set of management questions, indicators, and forums. A new column was added to capture the Accord parties' interest in the questions and indicators. As relevant, questions and indicators were revised to include sturgeon and lamprey. Some changes were made to the questions and indicators related to Harvest, Hatchery and Habitat. The subcommittee felt they did not have the right representation to address Habitat questions and indicators appropriately. Predation-related questions and indicators led to a discussion as to whether to focus solely on the fish species that are being preyed upon, or to also include marking (e.g., bands, branding) of the predator species (e.g., fish, avian, pinnipeds).
- Group Discussion:
 - Missing Expertise Input
 - o Additional input from NOAA and Tribes will be sought.
 - Explanation of Spreadsheet Organization and Missing Content
 - o The subcommittee will try to incorporate state tribal harvest management needs & other state/tribal tagging uses. Ideally we should try to keep forums consistent across all tabs for standardization hence the generality of the forums ID right now.
 - o When the subcommittee has taken a first cut at aligning tag types to indicators the full tagging forum will review and make adjustments. The subcommittee will also propose how to portray the linkages between questions and forums and between indicators and tag type. For example, this could consist of number scale or color code to capture the range in the degree of linkages, such as distinguishing between a tag type that is (1) widely used, (2) limited use, (3) future use for a given indicator, as well as the degree of interest, such as primary, secondary or tertiary interest.
 - o Other less commonly used tag types will be considered after the May Forum meeting.
 - Marking of non-aquatic predators
 - o On August 9, 2012, following the Council meeting in Spokane, the Council is holding a Predation workshop to engage the region on an ecosystem approach to managing and living with predators. That workshop may provide some other ideas for management questions we may want to answer through this FTF forum.
 - o The subcommittee will work on all the fish-related questions and indicators and defer the non-fish related questions and indicators for now.
- Next Steps:
 - o Currently, the subcommittee is seeking input from the broader FTF participants on the revised management questions and indicators. Specifically, the subcommittee would appreciate any comments on the management questions and indicators listed under the HATCHERY Tab, the HABITAT Tab, and the POPULATION STATUS RECOVERY Tab, but also on the other tabs.

- Comments should focus on whether the management questions broadly cover the questions answered by using the various tagging technologies. Questions are to be omitted that don't rely on tagging technologies.
- Comments should also assess whether the indicators listed under the management questions capture the range of indicators that use a range of tag types to inform a given management question. Non-tag informed indicators should be omitted.
- Please **provide your comments to Pat Frazier** (frazipaf@dfw.wa.gov), copying Nancy Leonard (nleonard@nwcouncil.org), by **Friday March 30, 2012**.
- The Subcommittee will be meeting again during the morning of April 24 (date to be confirmed by email) to address these comments and finalize the management questions and indicators. During this second subcommittee meeting the participants may begin populating the linkages between management questions and forums and between indicators and tag types.

2. Discussion of PIT Tagging

The intent of this agenda item is to better understand the value and use of the PIT tags to inform management questions, as well as to understand the cost-effectiveness of using this particular tag technology. Debating the validity of the scientific results included in some of these presentations is not the intent of this agenda item.

- a. [Presentation by Pete Hassemer](#) (IDFG)
 - Provide an overview of PIT tag use in the Basin with a focus on anadromous fish, as a foundation for the subsequent case studies being presented later.
 - Group Discussion:
 - Detection Efficiency
 - Detection probability at BON is about 98%.

PIT tag loss and mortality

- Pete H: IDFG has some studies that are assessing tag loss but no results yet. During 2012 in Snake River basin IDFG will be tagging a known amount of salmonids and will assess how many of the tagged fish are detected at Lower Granite Dam which can give an idea of tag loss. Tag related mortality is normally minimized by tagging protocols that provide constraints under what temperature range the fish can be handled and tagged. We have some sense of tagging related mortality, based on data from the Rapid River hatchery in Idaho where a known number of fish were tagged, we assessed the number of tags found in the ponds, and assessed the number of tagged fish detected, and took into consideration detection efficiency, and found that out of 470,000 fish there were about 470 fish unaccounted for and assumed dead. But we did not assess if that percentage of mortality differed from untagged fish.
- Jim Ruzycski.: PIT tag shedding and mortality occurs over an extended period.

- Doug Marsh.: PIT tag shedding in steelhead about same which is less than 100th of 1 % to about 300th of 1 %.
- Pete H – 1.2% is the average PIT tag loss over nine years in the Rapid River Hatchery group we have assessed. In other groups it has been higher. Doug M. also seems to experience higher mortality during PIT tagging at Lower Granite Dam at the end of April but is not sure what the cause is for this increased mortality.
- Curt Knudson: to assess short term mortality of PIT tag versus non-tagged fish, we assessed mortality of fish held at Yakima post-tagging, and observed a low mortality similar to non-tagged fish of about 1-3%. So tag loss was low about 1-3% prior to release. It wasn't until we looked at adult return and compared double-tagged fish (using CWT and PIT tags) to assess tags lost post release that we found about 14 to 18% +/- 1.2% tag loss rate across 5 brood-years with 25,000 fish per year being released. In some years there was very low percent mortality rate and in others it was as high as 36%, but average rate across the 5 years was 10%. We controlled for the people that tagged, and tagging conditions were considered to be excellent regarding temperature, so based on all those metrics the quality of fish released should have been fine. We also assessed the efficiency of tag detection by looking at the percent of carcasses we detected or missed that were located on the spawning grounds and assessed that the detection efficiency was about 98% (or 96%).
- Doug Marsh & Sandy Downing (NOAA) shared with the group that they are working on a proposal, in collaboration with the NOAA Alaska Science Center, to assess tag loss for the 3 PIT Tag types to assess their effects. The proposal study site is ideal as it is a short river that directly connects to the ocean to avoid the complication of considering in-river survival. The study is still in the proposal phase, and funding has yet to be secured. In the best case scenario, we estimate the study could start as early as 2014 focusing on Chinook and possibly coho. Based on when brood stock will return to this river, studying the effects on steelhead would not be able to begin until 2016.
- Dan R., it is important to understand tag-related mortality within context of how it may impact your study. It is important to recognize that information related to tag mortality differs depending on the study and tag loss and how these effect what you are trying to study. There is some different info on tag loss and tag mortality. Some of the findings might be species specific. So we need to be aware of that different results can be obtained for hatchery vs. natural fish and for various species.
- Pat F: Could the tag-related mortality also vary based on locations? Dan R: yes location could be a factor. Although we have fairly 'stable locations' of where these fish are tagged.
- Pete H.: it might also be important to consider other uncertainties and how these can be addressed with PIT tags. For example, there are uncertainties associated with effects of PIT tags on juvenile fish but we have not been able to address these in the past. With the installation of instream PIT tag arrays we may be able to start addressing these uncertainties. Need to also remember that some of the uncertainties associated with PIT tags may also apply to other tag technologies.

Detection through Bypass System

- TG: What is the probability of detecting juvenile fish passing through a bypass system? Pete H: I think it is close to 100%. Dave Marvin: We have 6 detectors installed below the separator; and have 4 antennas in the full flow system so we have good detection. However, with larger antennae and larger concentration of fish we may have tag collisions, which may decrease detection percentage. But even with the potential of tag collisions, it still looks like we see 98% detection even in the full flow bypass.

Cost

- TH: What are the costs associated with PIT tagging. It is hard to determine because of the infrastructure that is needed. Dan will get at some of this with his Wind River example. But basic costs include: purchase of tags, capture costs, tagging costs, cost of tag detectors, and database management.
 - Kevin: What is the life of a PIT tag detector array? Pete: flat plate detectors can last 3-4 years, but it's more variable with tubular PVC detectors in tributaries, which are subject to a wide range of flow conditions. Also, prudent siting of electronic equipment is important. Sandy D.: A flat plate array has a 20-24 inch depth detection range.
- b. [Presentation by Jim Ruzycski](#) (ODFW)-Monitoring and evaluation in NE Oregon.
- Jim Ruzycski: PIT tags and detection arrays can be used to verify screw trap efficiency. Parr and smolt salmon life stage can be tagged with PIT tags. Fish returns and migration patterns can be observed. Stray rates can be determined. PIT tags are also used to assess VSP parameters and various management actions such as in-season fishery predictions.
 - Group Discussion:
 - Tony Grover and Jim Ruzycski: hatchery fish also have CWT so these fish are hand-wanded to detect tag and some fish also have a scale sample removed.
- c. [Presentation by Dan Rawding](#) (WDFW) on Steelhead life cycle modeling in Wind River
- PIT tags can be used to partition winter run steelhead throughout their lifecycle. PIT tags can also be used to calculate adult conversion from Bonneville Dam to Wind River. From our studies we have observed that about 10 to 15% steelhead are repeat spawners (about 1% for Snake River). We also use PIT tags to estimate smolt and adult abundance. Wind River PIT tag detection efficiency is about 64%. We estimate that the cost of PIT tagging, including the tagging, data management, and analysis, is about \$20,000 to \$30,000 annually. This averages out to \$1.60 per PIT-tagged fish versus \$0.10 per CWT tagged fish. PIT tags can also be used to estimate harvest in Zone 6. We have also used PIT tags to evaluate Lewis River bull trout. For bull trout PIT tag loss is also low, and is estimated to be about 1/200.
 - Group Discussion:
 - How do you sample bull trout? Use tangle nets or set nets to capture ~300 mm sized fish.

- There are PIT tag detectors at Carson Hatchery.

PST use of PIT Tag instead CWT

- Therese H.: why would Pacific Salmon Treaty (PST) members not accept the use of PIT tags instead of CWT? Dan R.: the PST would first need to get all parties' consensus to use PIT tags instead of CWTs as CWTs are written into the agreements as the required technology. Then the parties would need to determine associated costs of converting to PIT tags, and then agree on how the PIT tag data would be analyzed. Pete H.: plus every boat would need to be fitted with a PIT tag detector since the fish are gutted onboard. Pat F.: Canadian members of PST would need to agree to the conversion and all PST members would need to agree to retrofit all the recovery sites. Dan R.: PST members may be concerned with PIT tag effects on fish.

Use of PIT Tags outside the Columbia River Basin

- What is the extent of PIT tag use outside the Columbia River Basin? The extent of use is not to the same scale as in the Columbia River Basin. In eastern USA (e.g. Atlantic salmon), Europe and Asia PIT tags are used but on a smaller scale. In Washington state, the majority of PIT tag use occurs within the Columbia River Basin. There are some studies using PIT tags in Alaska and California.

Effectiveness of PIT tag versus CWT

- Are you comparing the effectiveness of CWT versus PIT tag? Dan R.: not really. Doug M: you have the ability to obtain much more (and finer scale) data using PIT tags versus brands or CWT tags. Josh Murauskas: PIT tag would seem better given that CWT data has a long-term delay before the data is available for SAR data.

d. Presentation by Bill Muir (NOAA) on NOAA PIT Tag Research

- Presented information obtained using PIT tags in Snake River run-of-river fish collected and tagged at Lower Granite Dam for in-river reach survival, travel time and transportation studies. NOAA relies on tagging efforts from other studies throughout the basin. This survival and travel time data is also used to identify problem areas in the hydropower system. To get in-river juvenile fish survival rates all the way through the federal hydropower system to Bonneville Dam, we need to have PIT detection below Bonneville Dam, i.e., the NOAA PIT tag trawl and on the avian predator colonies in the estuary. However, the NOAA estuary PIT trawl's detection efficiency is only about 2%.
- Group Discussion:
 - PIT tag survival data is used by NOAA in its COMPASS model and to measure adult conversion rates for the FCRPS BiOp. Some adult radio tag studies also use PIT tags to verify results.
 - Is NOAA coordinating its use of PIT tags with other studies in the Columbia River Basin? Yes, NOAA does coordinate and use PIT-tagged fish from other studies, e.g., CSS tagged fish.

- e. [Presentation by Tom Rien](#) (ODFW) on Using PIT tags in Lower Columbia River Sturgeon Studies
- Presently there is only one white sturgeon population in the Columbia River Basin that is ESA-listed, and that is the population in the Kootenai River. Below Bonneville dam, only about 2% of PIT-tagged sturgeon are recaptured; whereas above Bonneville dam, between Bonneville dam and McNary dam, we have about a 10% recapture rate for fish. Above McNary dam, there is not as much tagging being done that is used by ODFW. But this presentation doesn't include all the PIT tag data available for sturgeon, since the Public Utility Districts and other entities are also PIT tagging sturgeon elsewhere in the Columbia River Basin.
 - Sturgeon are slow to mature, we consider fish between 1 to 10 years of age as juveniles. Sub-adults are between 11 years until they become sexually mature. Adults are sexually mature individuals, with maturation being achieved at about 25-years for females. Recruitment is greatly influenced by flow, with more flow providing better spawning conditions. PIT tags are helping to explain a portion of the unexplained losses (e.g., turbine entrainment, exiting the pool, etc.) of sturgeon from reservoirs.
 - PIT tags are not being used much to assess sturgeon mortality rates, but perhaps it is feasible to eventually obtain PIT tags from pinniped fecal samples to assess mortality rates by pinnipeds. PIT tags are also used to assess sturgeon exploitation rates. For Kootenay River sturgeons, the confidence intervals related to PIT tag data are becoming narrower simply because sturgeon live a long time and thus over time a greater proportion of the population is being tagged and detected. We estimate that about 70% of the Kootenay River sturgeons are now tagged.
 - Can use PIT tags to estimate annual survival, but this is a tricky calculation based on the Catch Curve method because to use this method you need to know the age of the fish; and to estimate a fish's age based on growth rate you need to assess that there haven't been any changes in the environment that may impact growth rate. Regardless, the estimated annual survival rate for Bonneville reservoir has fairly narrow confidence intervals and we expect these to improve over time as a larger proportion of the population is tagged.
 - Use PIT tags to assess whether transplanted sturgeon distribute similarly to the non-transplanted sturgeon, and also to compare transplanted sturgeon survival to non-transplanted sturgeon. Overall these two groups of sturgeon appear to be similar in terms of distribution and survival.
 - Have not used PIT tags much to assess sturgeon hatchery effectiveness but this may become more prevalent if we do set up more sturgeon hatcheries. Currently most of this work occurs in the Kootenay River. We are working with the PUDs to assess some amount of hatchery effectiveness since we expect entrainment downstream of the reservoirs.
 - Use PIT tags to assess sturgeon movement among reservoirs, movement and entrainment rate is small, and is assessed to be about 3% entrainment downstream and about 1% upstream movement in between reservoirs
 - Exploitation rate can be assessed based on the PIT tag found in fish.
 - For sturgeon, opportunity for remote detection [*within larger reservoir pools and outside the Columbia River Hydrosystem*] of PIT tags is currently limited. It would be

good to improve remote detection, especially as we improve mainstem detection ability.

- Cost of a PIT tag is less than \$2 or \$2.40 per tag under BPA's PIT tag purchase agreement.
 - Studies outside of the BPA PIT tag purchase agreement have a higher cost associated with the PIT tags, with a PIT tag costing about \$2.85.
 - Some challenges involved with PIT tagging sturgeon is that you need to find a unique placement for the tag to make sure it doesn't end up in the fillet (near dorsal area).
 - Currently green sturgeon are not tagged [*due to the Green Sturgeon southern distinct population segment being listed under the ESA*].
 - Sturgeon that were tagged with an older version of PIT tags are not easy to detect, and require an older version of the detection wand. When re-captured, these fish are injected with a new PIT tag that is more easily detected with the current standard wands.
 - Interesting to note that two PIT tag sturgeon from Columbia River were detected in the Fraser River in British Columbia.
 - Canada may be developing a PIT tag database.
- f. [Presentation by Sandy Downing](#) (NOAA) on Emerging PIT Tag Technology
- Have been working with the same company for years that has helped developed tools with their engineers. The company's name has changed frequently (changed name from Destron back to Destron to Allflex). The Biomark Company has all the fisheries representatives and they are the ones that install the equipment; Allflex owns a controlling share in Biomark.
 - One of the new tags (16 msec tags) will facilitate detection in faster water flow rate conditions which will provide an improvement in the detection rate. So these new tags may be useful for spillway detection of tagged fish.
 - Currently developing slender and smaller tags to use for tagging juvenile lamprey, such as a slender 8mm x 1.23mm tag, which was tested by NOAA.
 - Recently emerging technology to detect tagged fish in the estuary has included installing PIT antenna on pile dikes in the estuary, using a trawl based antennae, and also installing an antenna under a bridge near the entrance to Drano Lake.
 - Future emerging technology includes installing flat plate detectors on a temporary spill way (TSW) at a mainstem dam (Lower Granite), installing PIT arrays all the way across the John Day River, identifying a suitable PIT tag for tagging juvenile lamprey, and outfitting the PIT trawl with a separation by code capability.
- Group Discussion:
- Development of PIT Tag Technology and Compatibility Concerns
- o In the next few years [*will*] the PIT tag system will be using a new model of tags and transceivers? A new transceiver will be used but not sure about using the new SST-1 tag, might take a bit longer before we can transition to those tags.
 - o Will we need to replace existing antennae infrastructure? No, the existing antennae and new transceiver will be compatible.
 - o If mainstem needs are driving the development of PIT tag technology is it feasible that tributary PIT tag needs will be left behind? Mainstem needs are not driving the

technology. The new SST-1 tag was developed primarily for tributary needs and not for mainstem needs. NOAA is not interested in driving PIT tag technology, but is interested in improving the technology. BPA-funded research has helped get the instream PIT tag technology to where it currently is today.

Detection of PIT Tags

- What is the depth profile of fish over the spillway? Not sure, we don't know where they are within the water volume, whether they are on edge or in the middle of the spillbay. We assume we need to cover the entire depth.
- For some purposes even if detection efficiency is not high perhaps that is good enough to answer the questions posed.
- Some folks want to detect fish within the Willamette River Basin, but this is a very different set of dams than those found in the Columbia River Basin. We are starting to talk about fish bypass at these Willamette River dams, and sometimes in those discussions they forget about PIT tag detection within the bypass systems. It would be great for Willamette RME studies to have better PIT tag detection capability at Willamette Falls.

g. Presentation by John Tenney (PSFMC) on PITAGIS

- The new Data Mart & Reporting Environment should be available next week (week of March 26, 2012). It will allow fish managers to work with the data in an aggregated form, allowing them to filter all these data, until there is a subset that the manager wants to export. Whereas, in past managers had to extract all these data into Excel spreadsheet and then filter out the subset of data they wanted.
- Metadata management for interrogation sites is important to facilitate uploading new PIT tag detection sites, such as new sites being installed in the tributaries.
- We are developing a lot of GIS reporting tools. We have been asked by habitat folks to convert data to maps, so PITAGIS is working on geo-coding these data.

- Group Discussion:

Development of PITAGIS

- How long has it taken to develop this database technology? NOAA started developing this technology in 1987, and PITAGIS inherited it from NOAA. We have pretty much been using the same infrastructure ever since that time. We started the upgrade to a new platform a couple years ago.

Non-Salmonid Data

- Does PITAGIS only store data related to salmon and steelhead? We incorporate all species that are PIT-tagged, such as bull trout. PITAGIS has a steering committee that provides input from states and tribes on what PIT data to collect. The steering committee reviews the metadata and the request for incorporating new data, and then the steering committee either gives the go-ahead to add the data to PITAGIS or not. Field folks need to go through their steering committee representative to get new data approved for incorporation into PITAGIS. This process sometimes has a backlog associated with it, so PITAGIS hopes to move to a web-based request that also captures metadata for the proposed data.

Potential Use for Assessments

- Dan R.: PITAGIS works well for storing PIT tag data and for estimating survival. How about the potential of using PITAGIS to conduct [*a variety of*] fish assessments and abundance, is this possible? We did discuss this at a workshop; we believe this will be feasible when we move to our new PITAGIS platform (M4 software that is planned to be released next year or soon thereafter). We could explore what can be done to extend the metadata to allow inclusion of additional data etc. It is also possible that we could link to the CWT database and other PSFMC databases and external databases, to facilitate these type of assessments.

Identification of Double-Tagged Fish

- Is there a way to know that a fish has both a CWT and PIT tag? The next marking software might facilitate searching the other tag databases to help find those fish. There is a comment box to allow input information about other tags, such as the CWT, related to the PIT tagged fish but this comment field is not easily searched. ... but that is voluntary information so it is limited in its comprehensiveness.
- h. [Presentation by Al Giorgi](#) (BPA Consultant - BioAnalysts Inc) on status of PIT Tag Plan
- Revising the document from a PIT Tag Plan to being more of an action plan for moving forward in the next decade. It aims to address more effective coordination of FWP projects that use PIT tags. It also aims to provide NOAA with information on how many ESA-listed salmonids are being handled so that NOAA can assess if there is a need to minimize the effect of tags in larger tagging programs. Jim Geiselman (BPA) is the one leading this effort. So you can contact Jim G. or Al G. with any questions or comments.
 - Group Discussion:
 - Will the revised PIT Tag Action Plan be available in spring? Likely by late spring.
 - Are you planning on using this document to inform the implementation plan? Yes, the plan will be informed by this document. The plan is not done yet, but it needs to be completed per requirements under the FCRPS Biological Opinion. The implementation plan will say where and when we want what done, like having PIT tag detectors in fish ladders by 2014, etc.
3. Recap and Plan Next Meeting
- Subcommittee spreadsheet and the context email, what type of input wanted, and comments to Pat and Nancy by March 30th.
 - Next Management Questions Subcommittee, tentatively scheduled for the morning of April 24th from 8am to 12pm at the Council office in Portland.
 - Next FTF scheduled for May 10th, from 9am to 4:30pm at the Council office in Portland. The scope of the next meeting will include: any feedback from April Council update; discussion of CWT; revisit scope and objectives from first FTF meeting and determine approach to discussing remaining tagging technologies and species not yet covered in meeting conducted to date.