**Note: this document is supplemental information that has been shared by a participant of the Fish Tagging Forum to be posted as part of the March 2012 Fish Tagging Forum** [**web-documents**](http://www.nwcouncil.org/fw/tag/meetings.asp)**, but was not presented to the whole forum during the March 2012 meeting.**

**Timeline of PIT Tag Separation-by-Code (SxC) Activities in the Columbia Basin**

**1987‑1992:**

 PIT tag detectors were deployed in the juvenile fish collection facilities (JFFs) at Lower Granite (LGR), Little Goose (LGS), and McNary (MCN) dams. Essentially all fish collected at these facilities, including those with PIT tags, were transported down the river to below Bonneville Dam.

**1993:**

 The JFFs at LGR and LGS were retrofitted with tag‑activated slide gates below the separator, and the facilities were re‑plumbed to divert all PIT‑tagged fish back to the tailrace. The non‑tagged population continued to be collected and transported at LGR and LGS.

 The new JFF at Lower Monumental Dam (LMN) began operating in 1993. The JFF contained PIT tag detectors, but all fish collected at LMN, including those with PIT tags, were transported in 1993.

**1994‑1995:**

 PIT tag diversion to the tailrace began at LMN in 1994. McNary transportation operations shifted to the new Oregon Shore JFF in 1994. All fish collected at MCN, including those with PIT tags, were transported in 1994. PIT tag diversion to the tailrace began at MCN in 1995.

**1996‑1997:**

 PIT tag Separation‑by‑Code (SxC) capabilities were implemented at the LGR and MCN JFFs in 1996, and in 1997 at LGS and LMN. Developed by Sandy Downing (NMFS), this SxC function provided the ability to identify and recapture individual PIT‑tagged fish by diverting them from the general population into dedicated sample tanks. Tissue and serum samples could then be obtained from these individuals to measure changes in physiology and morphology during the smolt migration. The SxC function also provided a method to "override" the default return‑to‑river diversion action for a proportion or entire domain of pre‑programmed PIT tag codes. The Comparative Survival Study (CSS) began using this "monitor only" function to route 75‑80% of their fish into the raceways for transportation rather than diverted back to the river. This is the first request for a variance from the default return‑to‑river action for PIT‑tagged fish collected at the transportation sites.

 The LGR adult fish trap was first instrumented with PIT tag detectors in 1988, but the trap gates were operated manually or triggered by the presence of a wire tag. In 1997, the trap was retrofitted to divert PIT tags on demand.

**1998:**

 The new full‑facility JFF began operating at John Day Dam (JDA), with SxC capabilities to sub‑sample specific PIT‑tagged fish. To avoid double‑handling previously‑tagged fish, the SxC function is also used to prevent PIT‑tagged fish from being collected at sample rates greater than 20%.

 PIT tag detectors were installed in the Adult Fish Facility (AFF) at Bonneville Dam (BON) in 1998. The AFF is only operated under manual supervision. The SxC software installed at the AFF activates a light‑‌and‑‌bell "signal‑by‑code" alarm to alert the gate operator to the presence of a tagged fish of interest.

**1999-2000:**

 PIT‑tagged fish were first systematically detected in the BON PH2 bypass in 1997, within the powerhouse immediately downstream of the primary dewatering tank. The detectors were moved to the new outfall location above Ives Island in 1999. SxC capabilities were added in 2000, when the JFF became operational. As at JDA, the SxC system is used to divert individual PIT‑tagged fish into either of two dedicated sample tanks.

 In 1999, NMFS (now NOAA-Fisheries) began transferring responsibility for SxC operations and maintenance to PSMFC, similar to the transfer in 1992-1993 of responsibility for the detection systems operations and maintenance (O&M). PSMFC collaborated with Sandy Downing to implement the SxC requests in 1999, and assumed responsibility for this coordination in 2000. PSMFC has managed the SxC requests and O&M duties ever since.

**2003‑2006:**

 Beginning in 2003, Jason Vogel (Nez Perce Tribe, NPT) requested that PSMFC implement the "monitor only" action at the transportation sites for portions of five groups of PIT‑tagged NPT fish. Unlike the CSS study, which diverted only one of four or five target fish back to the tailrace, the NPT study pre‑allocated their transport and in‑river candidates, and provided only the tags to "transport" to PSMFC; all of the NPT "in‑river" tags were diverted back to the tailrace using the default PIT tag diversion protocol, while the "transport" tags were ignored at the separator gates and allowed to pass into the raceways.

 In 2004, IDFG requested that their PIT‑tagged Redfish Lake sockeye be treated like the untagged run‑at‑large when detected at the transportation sites. Researchers from ODFW and WDFW began making similar requests in 2005. In 2006, the CSS study protocol was revised to specify the "monitor only" action for a pre‑allocated portion of the entire tagged population, similar to the protocol implemented by the NPT.

**2007‑present:**

 Most PIT‑tagged hatchery fish, and a large portion of tagged wild fish, are now transported from the Snake River transportation sites, either because they are in the control portions of the CSS or NPT release groups, or because researchers and resource managers desire to have their entire PIT‑tagged index groups treated like the untagged population. The majority of SxC requests at the transportation sites are now for "monitor only" actions to avoid segregating PIT‑tagged fish from the untagged cohort. (See the current SxC requests at Lower Monumental Dam for example, where all diversion requests are for "monitor only" actions.) The Fish Passage Advisory Committee is considering revising the default diversion action at the transportation sites so that PIT-tagged fish are treated as the run at large unless a request is made to return them to the river during the transportation season.

**SxC Summary**

There are currently Separation-by-Code capabilities at all six of the eight Federal Columbia River Power System hydroelectric projects equipped with juvenile fish monitoring facilities (BON, JDA, MCN, LMN, LGS, and LGR). PIT-tagged fish can be selectively diverted to/from transportation vessels at the four transportation sites. Additionally, at seven of those sites, pre-identified tagged fish can be selectively recaptured. These passively-targeted recapture capabilities are unique to PIT tag technology, allowing researchers (including those using other marks such as radio or acoustic tags) to measure changes in the physiology and morphology of individual fish during their downstream migration.

There are Separation- (or Signal-) by-Code capabilities at the Lower Granite Dam adult fish trap and the Bonneville Dam Adult Fish Facility. These systems allow researchers to identify and collect (or avoid) specific PIT-tagged fish during their upstream migration, reducing the need to handle a larger portion of the general population and minimizing handling impacts to other research projects.

It’s important to note that, as a component of the PIT tag detection systems, the SxC mechanisms are permanently integrated into the juvenile and adult fish passage routes, and their diversion logic systems provide the platform for the facilities’ general sampling controls. The consistent, reliable operation of these SxC systems is critical to facility operations and the integrity of the Basin’s fish passage studies.