



# PIT-Tag Effects Study

## *Carson National Fish Hatchery Spring Chinook Salmon*

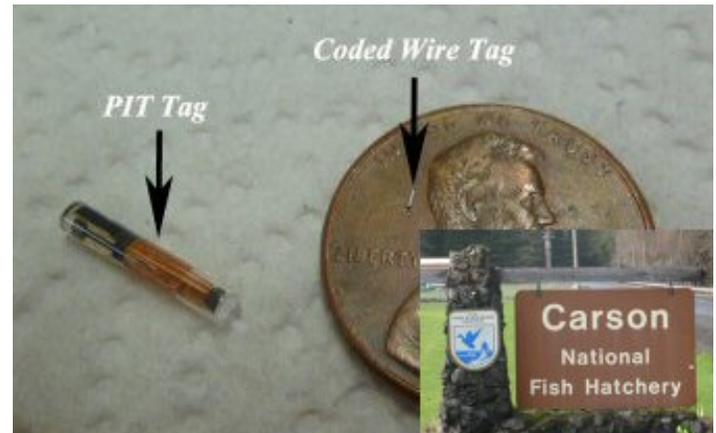
### Background

Coded wire tags (CWT) and passive integrated transponder (PIT) tags are used extensively throughout the Columbia River Basin to address a wide variety of management and research questions. A recent study found that dual-tagged (CWT and PIT tagged) hatchery spring Chinook exhibit lower smolt-to-adult return rates compared to CWT smolts, indicating that PIT tags may impart a survival bias. Given the widespread use of CWT and PIT tags, further evaluations of potential tag effects would be informative for quantifying the level of bias, if present, associated with each of these two tag types. Towards this end, we initiated the PIT Tag Effects Study (PTES) at Carson National Fish Hatchery (NFH) in 2010. The objectives are: 1) to determine the effects of PIT tags on spring Chinook salmon Smolt-to-Adult Return (SAR) rates and 2) to determine PIT tag loss rates throughout the complete salmon life-cycle.

### Methods

Carson NFH is located on the Wind River, Washington in the Gifford Pinchot National Forest. We selected Carson NFH for the PTES because its proximity to the PIT detectors in Bonneville Dam fishways and logistical ease of adult sampling. We were able to minimize cost and achieve the large tagging levels needed for this project by supplementing current tagging at the facility. Also, Carson NFH is located in the lower Columbia River Basin which would allow for comparisons to upper basin marking programs.

Spring Chinook salmon from brood year 2009 was the first release from this four-year study. The tag groups consist of CWT-only fish, PIT tag-only fish, and dual-tagged fish (PIT tag and CWT). All fish are adipose fin marked in the spring, tagged in November, and released into the Wind River the following spring. A sample of fish from each tag



Size comparison of a PIT tag and coded wire tag.

group is retained in the hatchery building for 30 days to assess initial tag retention rates.

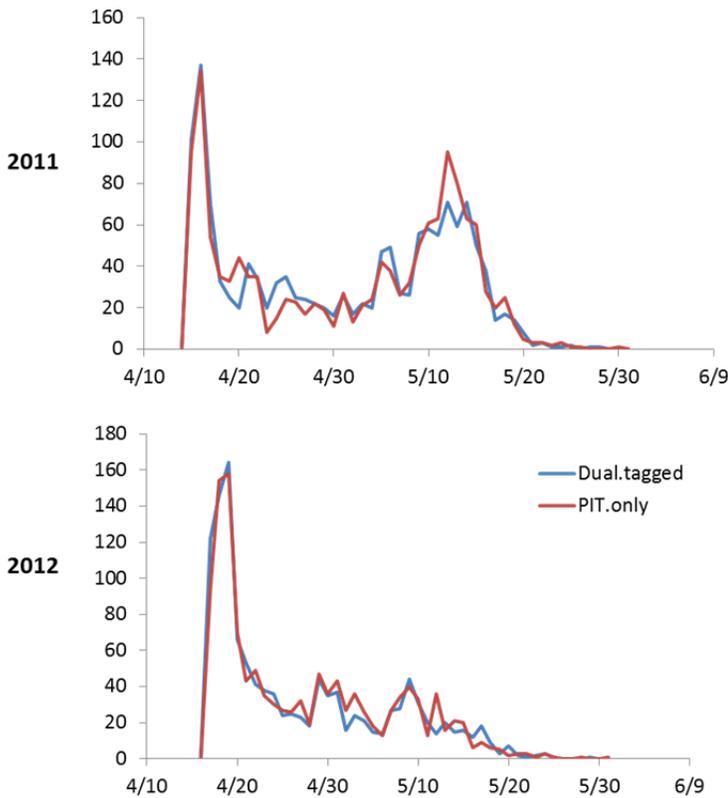
Once released the downstream and upstream migrations of PIT tagged fish are monitored through in-stream detection arrays located just downstream of the hatchery release site and in the Columbia River, including at Bonneville Dam and the mouth of the Columbia River. Adult spring Chinook return to the hatchery at 3,4 or 5 years of age and are held in ponds until they are handled for surplusing to the Tribes, inoculation, and/or spawning. As fish are handled, PIT tags are detected and CWTs are collected during surplusing and spawning operations.

The comparison of detection histories between the 3 tag groups allows us to determine the effect of a CWT or PIT tag on smolt-to-adult return rates. This data also allows us to determine where in the life cycle the effect, if any, occurs.

## Results

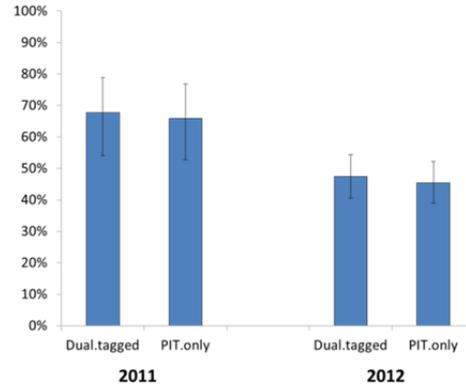
The PTES is a long-term project and all results are preliminary. Migration timing to Bonneville Dam of juvenile PIT-tagged fish is similar between tag groups and there is variation in migration patterns between years (Figure 1). Juvenile survival to Bonneville Dam is similar between groups (Figure 2). Currently, Smolt-to-Adult Return (SAR) information is limited to 3-year-old adults from the first release and there are no significant differences in SAR rates between the tag groups at this time (Figure 3).

### Migration to Bonneville Dam



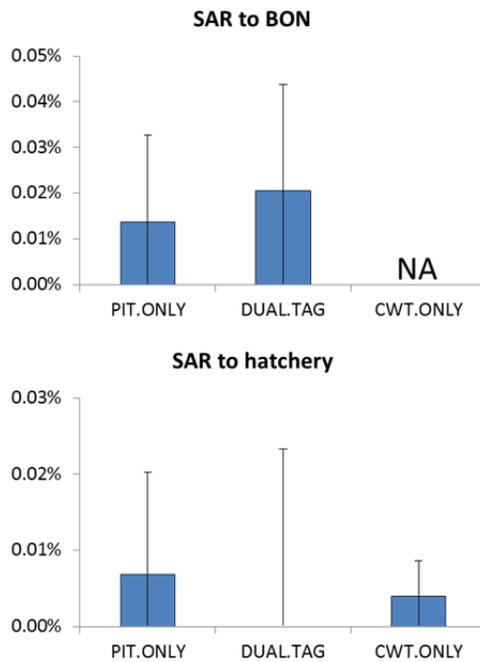
**Figure 1.** Migration timing to Bonneville Dam of PIT-tagged spring Chinook salmon released from Carson NFH in 2011 and 2012.

### Survival to Bonneville Dam



**Figure 2.** Juvenile survival to Bonneville Dam of PIT tagged spring Chinook salmon released from Carson NFH in 2011 and 2012.

### Smolt to Adult Return (SAR) rates



**Figure 3.** Smolt to Adult Return (SAR) rates to Bonneville Dam (BON) and Carson NFH for 3-year-old spring Chinook salmon from the 2011 release.



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