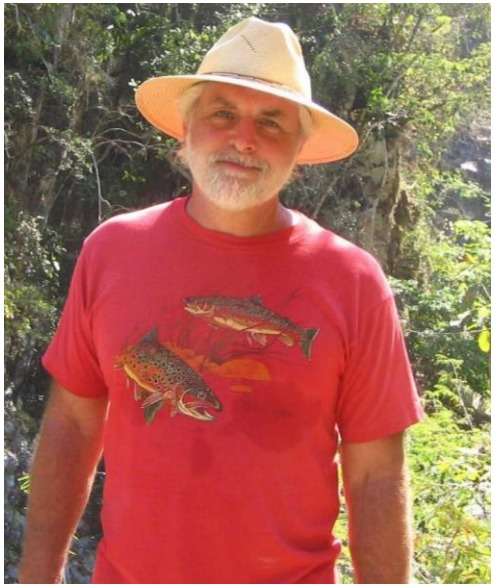
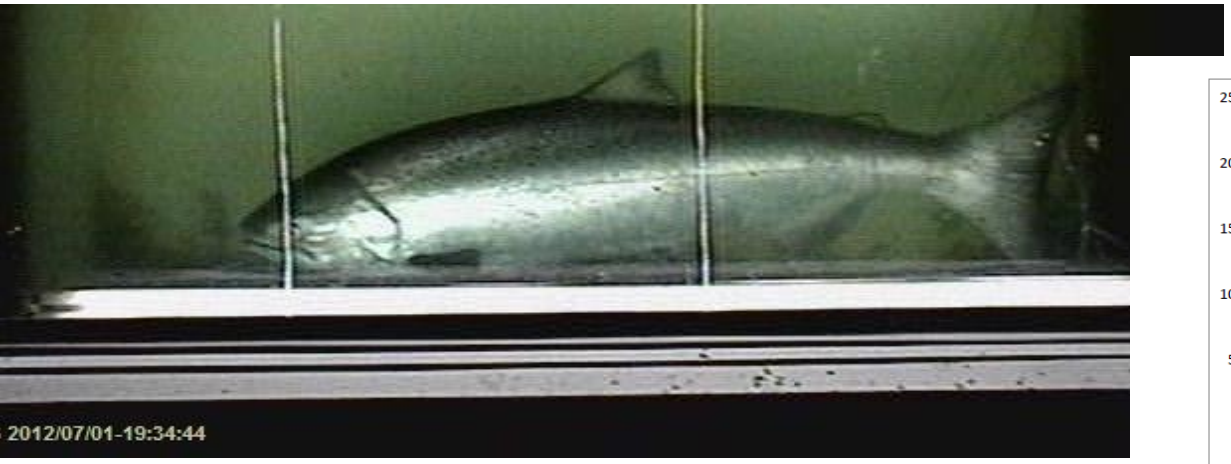
# A Comparison of Abundance and Harvest Estimates Using Traditional Methods and Passive Integrated Transponder Tag Detections for an Upper-Columbia River Basin Hatchery Population

William J. Bosch, Curtis M. Knudsen, Gabriel M. Temple, Mark V. Johnston, Anthony L. Fritts, and David E. Fast



Acknowledgments: Melvin Sampson, Levi George, Yakama Nation, CESRF staff, Joe Hoptowit, Roza crews, Roger Dick Jr., Megan Begay, Stuart Ellis, Jon Hess, Flo Wallahee, Winna Switzler, WDFW, NOAA, USFWS, BOR, CRITFC, PSMFC, and BPA

# We regularly report …



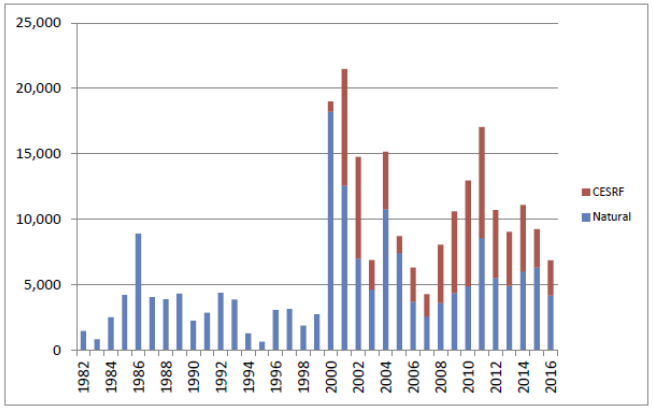




**Figure 2. Estimated counts of natural- and Cle Elum Supplementation and Research Facility (CESRF-) origin spring Chinook (adults and jacks) at Prosser Dam, 1982-present.**

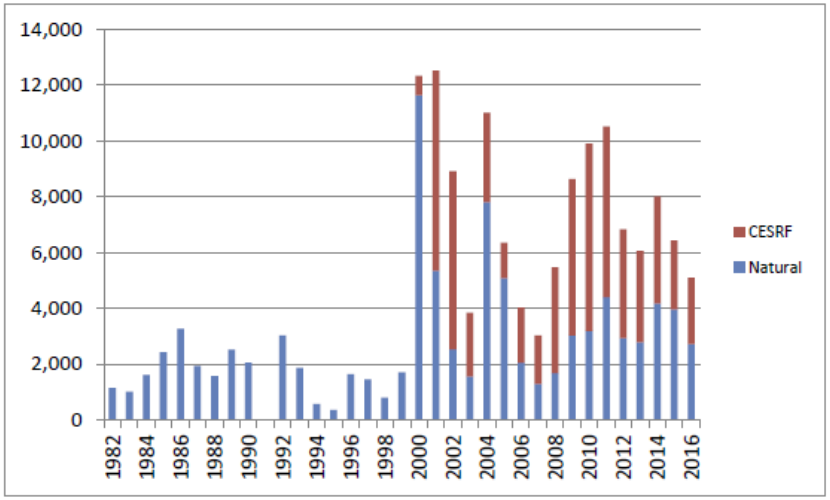
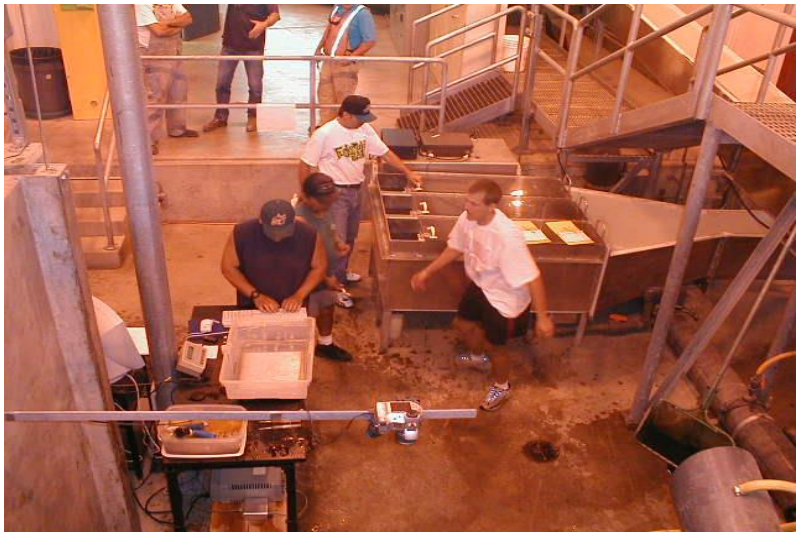



**Figure 5. Estimated counts of natural- and Cle Elum Supplementation and Research Facility (CESRF-) origin spring Chinook (adults and jacks) at Roza Dam, 1982-present.**



# And we can compute …




**Table 21. Estimated run size, harvest, and harvest rates of Yakima Basin spring Chinook in Columbia River mainstem and terminal area fisheries, 1983-present.**

| Year | Columbia R. Mouth Run Size | Col. R. Mouth to BON Harvest | BON to McNary Harvest | Yakima R. Mouth Run Size | Yakima River Harvest | Columbia Basin Harvest Summary | | | Col. Basin Harvest Rate | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total | Wild | CESRF | Total | Wild |
| 1983 | 2,452 | 118 | 99 | 1,441 | 84 | 300 | 300 | 0 | 12.3% | 12.3% |
| 1984 | 3,868 | 134 | 257 | 2,658 | 289 | 680 | 680 | 0 | 17.6% | 17.6% |
| 1985 | 5,248 | 191 | 178 | 4,560 | 865 | 1,234 | 1,234 | 0 | 23.5% | 23.5% |
| 1986 | 13,514 | 280 | 783 | 9,439 | 1,340 | 2,403 | 2,403 | 0 | 17.8% | 17.8% |
| 1987 | 6,140 | 96 | 371 | 4,443 | 517 | 984 | 984 | 0 | 16.0% | 16.0% |
| 1988 | 5,631 | 360 | 372 | 4,246 | 444 | 1,177 | 1,177 | 0 | 20.9% | 20.9% |

**Zone 6** Treaty Indian Fishery
147 miles of river open to Indian commercial fishing

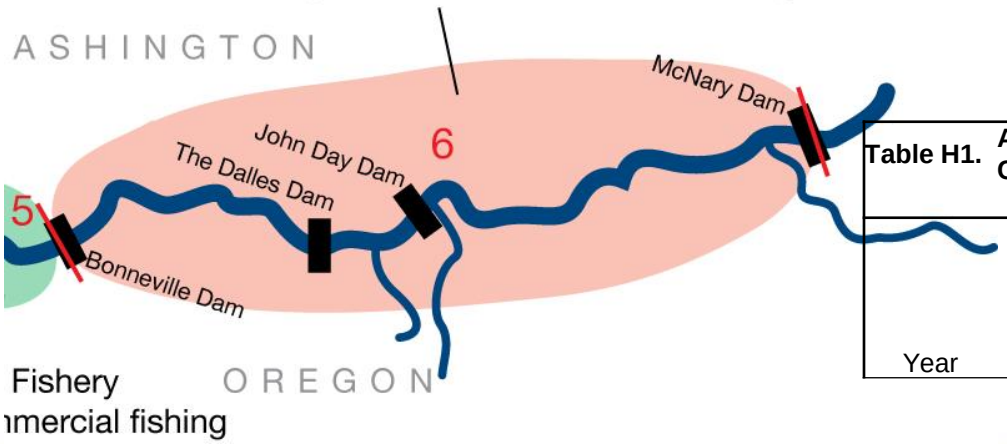



**Table H1. Adult new SPRING chinook conversion calculations for lower Columbia River dams.**

| Year | BON Count | Zone 6 Catch | Zone 6 Tributary Loss | Zone 6 Tributary Turnoff | MCN Count | Conv. BON to MCN a_/ | Conv. per Project |
|---|---|---|---|---|---|---|---|

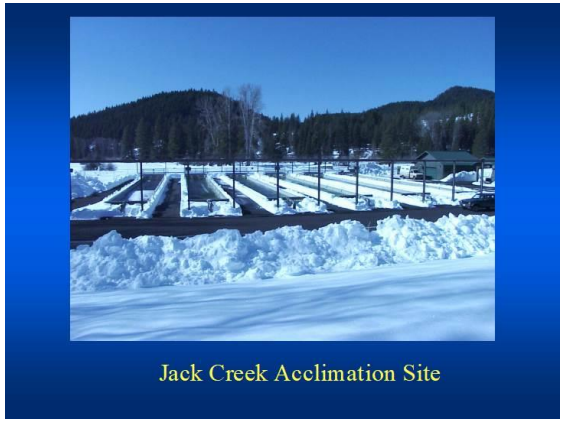
# But how good are these estimates?



# Methods – Total Release

## Growth and Survival History - BY2015

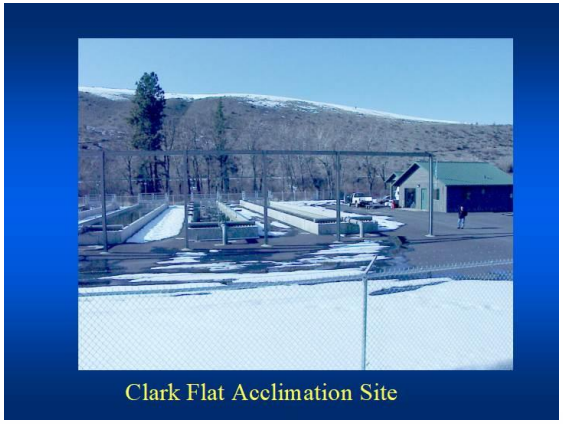
| SiteID | Date | OnHand | Pounds | Morts | FoodFed | AvgWt | Gain(lbs) | FoodConv. |
|---|---|---|---|---|---|---|---|---|
| CLE01 | WN PRO | | | | | | | |
| | 1/31/2016 | 36,485 | 24.7 | | | 1,479.9 | 0.0 | |
| | 2/29/2016 | 36,438 | 24.6 | 47 | 0.1 | 1,480.0 | 0.0 | |
| | 3/31/2016 | 36,298 | 48.6 | 140 | 19.0 | 747.4 | 23.9 | 0.8 |
| | 4/30/2016 | 35,789 | 101.1 | 509 | 41.5 | 353.9 | 52.6 | 0.8 |
| | 5/31/2016 | 35,628 | 194.5 | 161 | 82.0 | 183.2 | 93.3 | 0.9 |
| | 6/30/2016 | 35,586 | 412.5 | 42 | 148.6 | 86.3 | 218.0 | 0.7 |
| | 7/31/2016 | 35,558 | 585.1 | 28 | 219.3 | 60.8 | 172.6 | 1.3 |
| | 8/31/2016 | 35,522 | 849.7 | 36 | 282.3 | 41.8 | 264.7 | 1.1 |
| | 9/30/2016 | 35,491 | 1,162.6 | 31 | 317.5 | 30.5 | 312.9 | 1.0 |
| | 10/31/2016 | 34,798 | 1,165.5 | 179 | 79.4 | 29.9 | 2.9 | 27.5 |
| | 11/30/2016 | 34,711 | 1,273.6 | 87 | 126.8 | 27.3 | 108.1 | 1.2 |
| | 12/31/2016 | 34,699 | 1,337.1 | 12 | 51.6 | 26.0 | 63.5 | 0.8 |
| | 1/31/2017 | 34,686 | 1,208.0 | 13 | 18.0 | 28.7 | -129.1 | |
| ESJ01 | 1/31/2017 | 34,662 | 1,207.2 | 24 | 40.0 | 28.7 | -0.8 | |
| ESJ01 | 2/28/2017 | 34,639 | 1,427.8 | 23 | 44.0 | 24.3 | 220.6 | 0.2 |
| ESJ01 | 3/31/2017 | 34,621 | 1,471.4 | 18 | 154.2 | 23.5 | 43.6 | 3.5 |
| ESJ01 | 4/30/2017 | 34,620 | 1,757.2 | 1 | 238.1 | 19.7 | 285.8 | 0.8 |
| **Total** | | **34,620** | **1,757.2** | 1,351 | 1,862.4 | **19.7** | 1,732.6 | 3.1 |



Jack Creek Acclimation Site

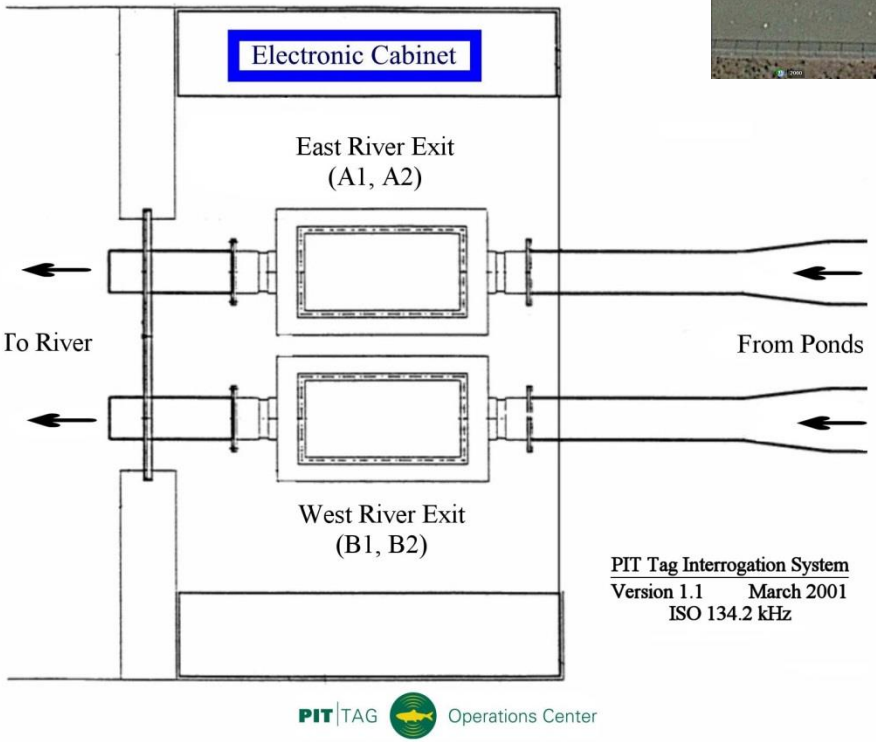
Easton Acclimation Site

# Methods – PIT Release

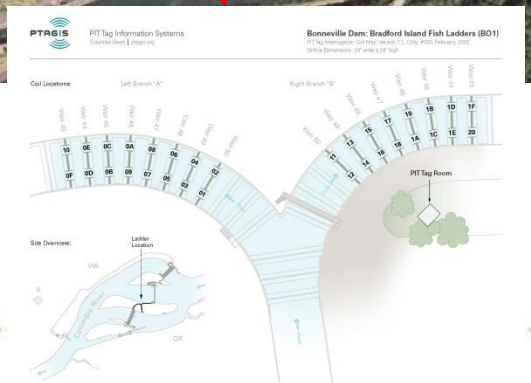




Clark Flat Acclimation Site (CFJ)
Volitional Release Monitors




# Methods – Adult PIT Detect


**Complete Tag History For:** 3D9.1C2DB981E0

## Mark and Release Information

| Species-Run-Rear Type | Mark Site | Release Site |
|---|---|---|
| Hat. Spring Chinook | CLEE | CLARFP - Clark Flat Acclimation Pond 03 |

| Coordinator | Session Message |
|---|---|
| DTL - David Lind | YAKIMA-KLICKITAT FISHERIES PROJECT, CLE ELUM SPRING CHINOOK RELEASES, 2013 |

| Mark Date | Release Date | Conditional Comments (Flags) |
|---|---|---|
| 10/16/2012 | 03/15/2013 | |

| Capture Method | Text Comment |
|---|---|
| Dip Net | |

## Recapture, Observation, and Mortality Information

| Event Date | Event Type | Event Site Code | Event Site Type | Event Site RKM | Event Release Date | Event Release Site Code | Event Release Site RKM |
|---|---|---|---|---|---|---|---|
| 03/20/2013 | Observation | CFJ | Monitored Fish Release | 539.270 | | | |
| 05/02/2013 | Observation | PRO | Combined Dam Location; separate detections of upstream and downstream migrants. | 539.076 | | | |
| 05/09/2013 | Observation | JDJ | Juvenile Fish Bypass Facility | 347 | | | |
| 03/31/2015 | Observation | BO3 | Adult Fishway | 234 | | | |
| 04/01/2015 | Observation | BO4 | Adult Fishway | 234 | | | |
| 04/02/2015 | Observation | BO4 | Adult Fishway | 234 | | | |
| 04/05/2015 | Observation | TD1 | Adult Fishway | 308 | | | |
| 04/11/2015 | Observation | MC2 | Adult Fishway | 470 | | | |
| 04/18/2015 | Observation | PRO | Combined Dam Location; separate detections of upstream and downstream migrants. | 539.076 | | | |
| 04/29/2015 | Observation | ROZ | Combined Dam Location; separate detections of upstream and downstream migrants. | 539.206 | | | |
| 04/30/2015 | Observation | ROZ | Combined Dam Location; separate detections of upstream and downstream migrants. | 539.206 | | | |

# Methods – PIT-Based Abundance

Knowing the number of

- fish released from each raceway (j) in each brood year (l), and
- PITs detected leaving each raceway in each brood year

Which gives us an estimated total number of fish represented by each subsequent PIT detection for that brood year and raceway:

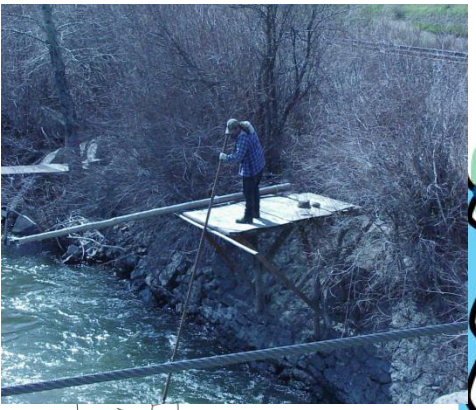
$$RW_{j,l} = REL_{j,l} / PIT_{j,l}$$

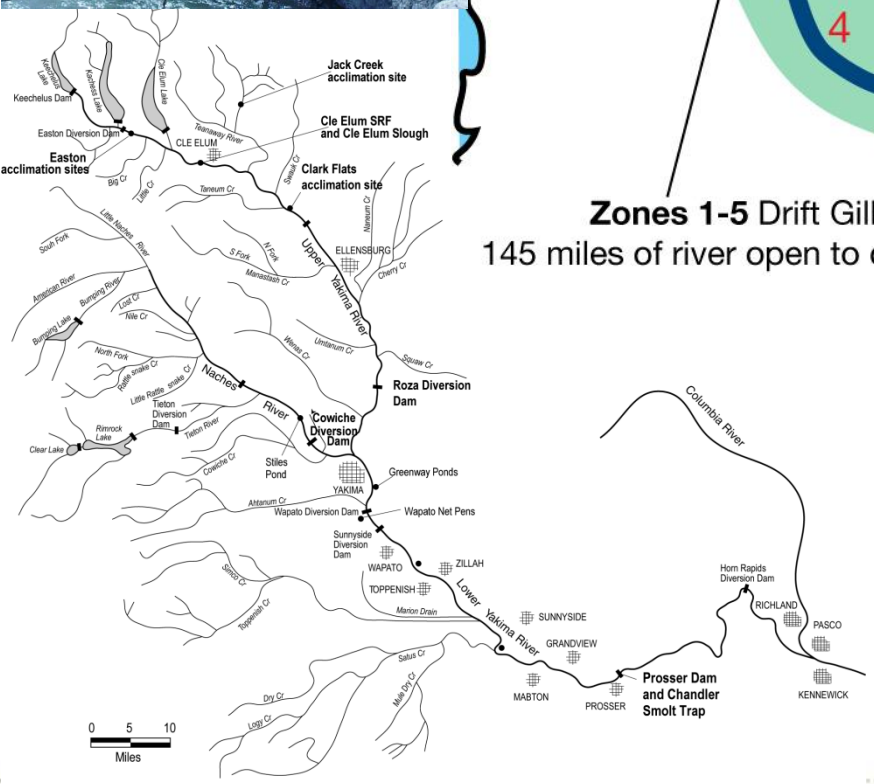
Then decoding each PIT detected as an adult by brood year (l), raceway (j), and age (k)

We can sum the total adult detection expansions for any return year (i) at any adult PIT detection location as:

$$RET_i = \sum_{l=2003}^{2013} \sum_{j=1}^{18} \sum_{k=3}^{5} (PIT_{l,j,k} * RW_{j,l})$$

# Methods – PIT-Based Harvest



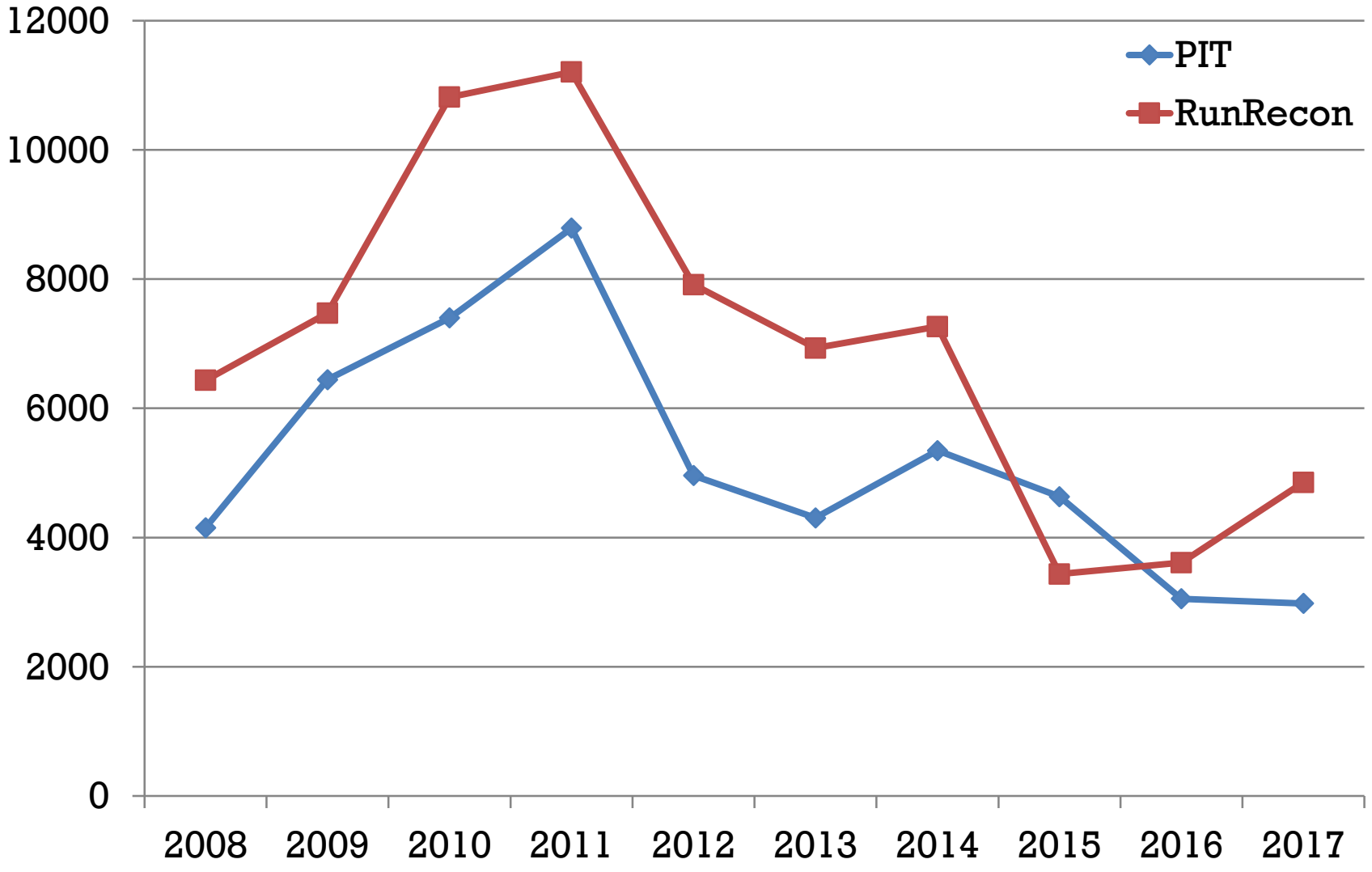




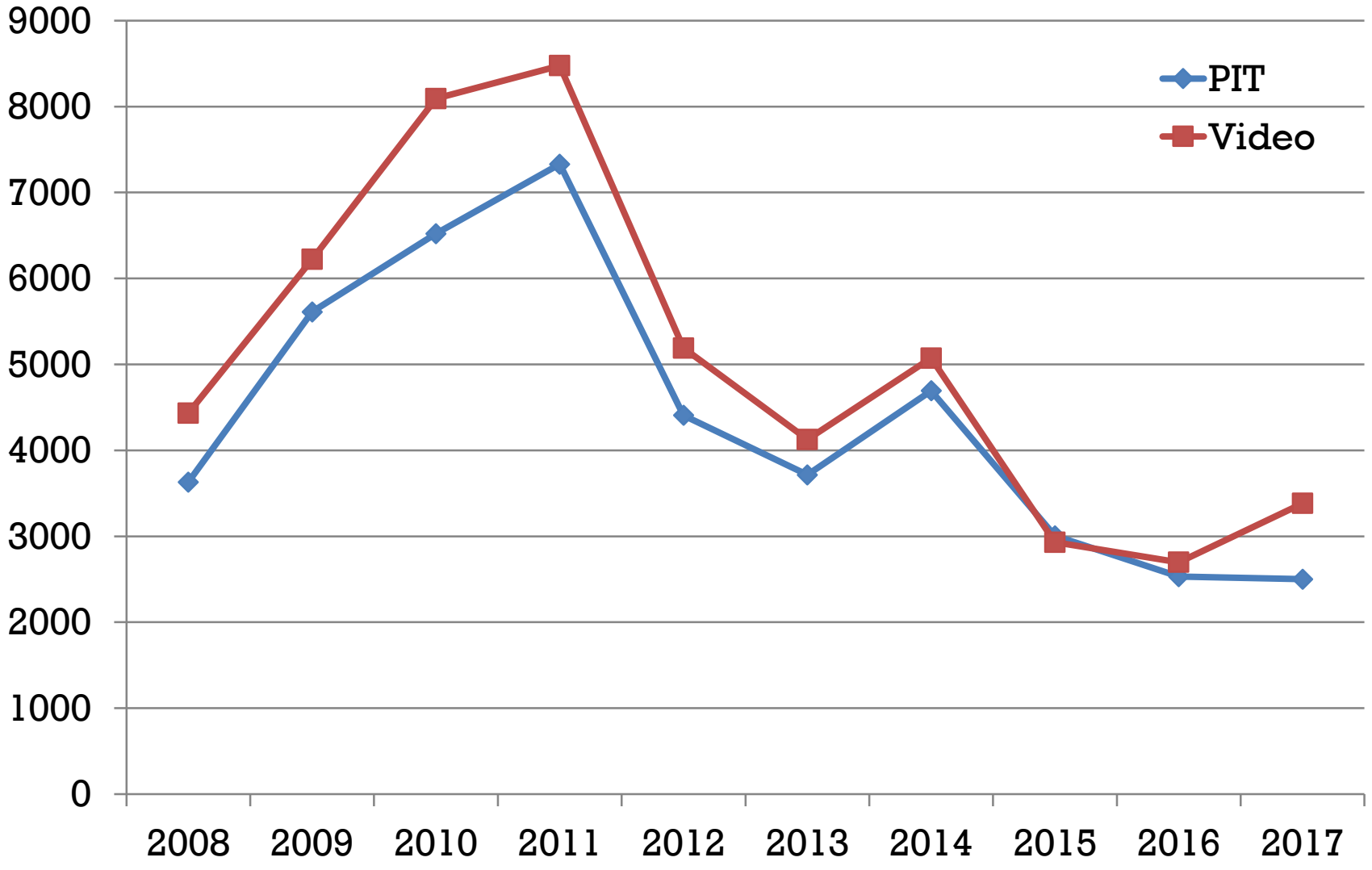
**Zone 6** Treaty Indian Fishery
147 miles of river open to Indian commercial fishing

**Zones 1-5** Drift Gillnet Fishery
145 miles of river open to commercial fishing

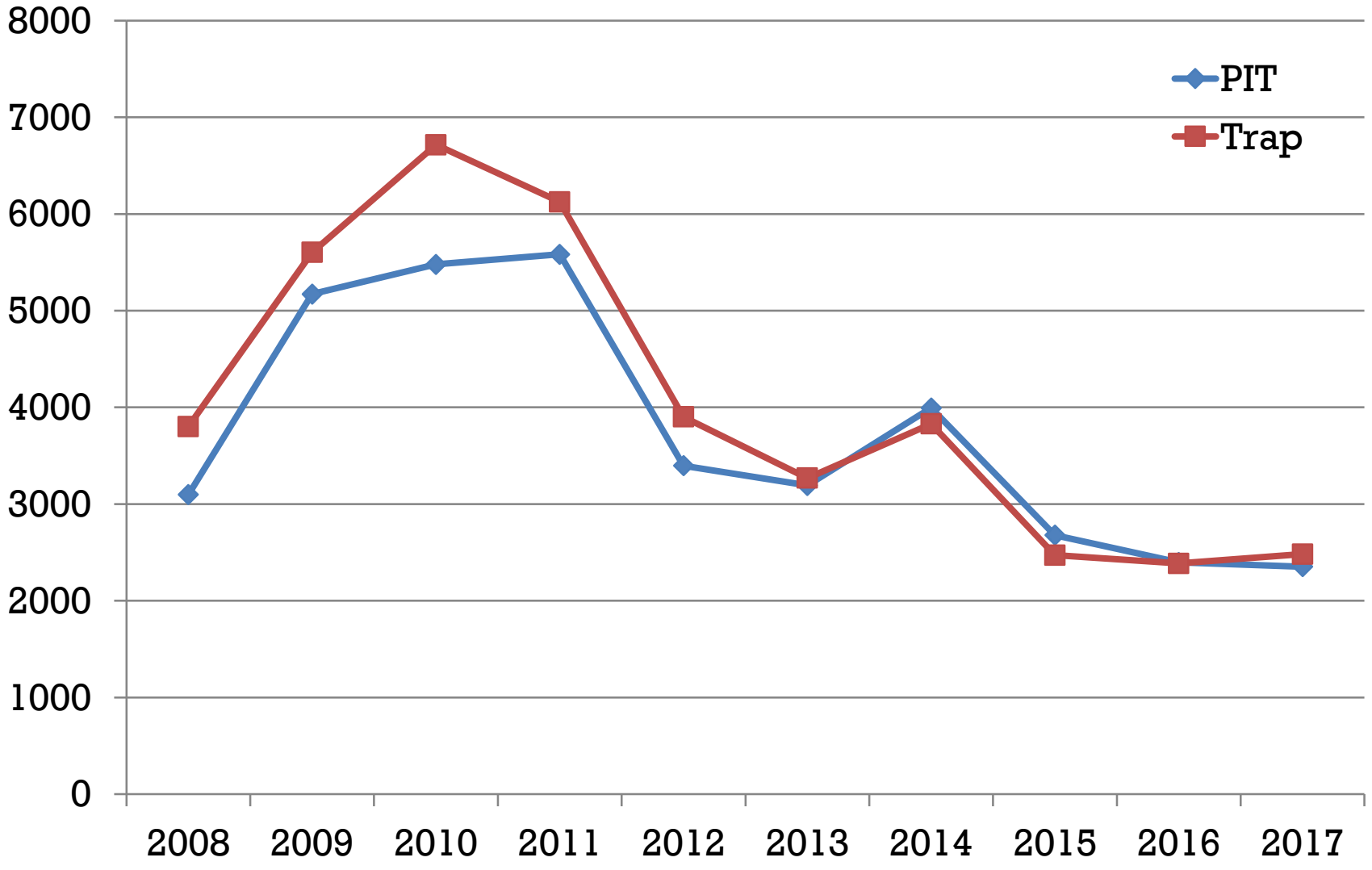
# Results – Bonneville Dam Abundance



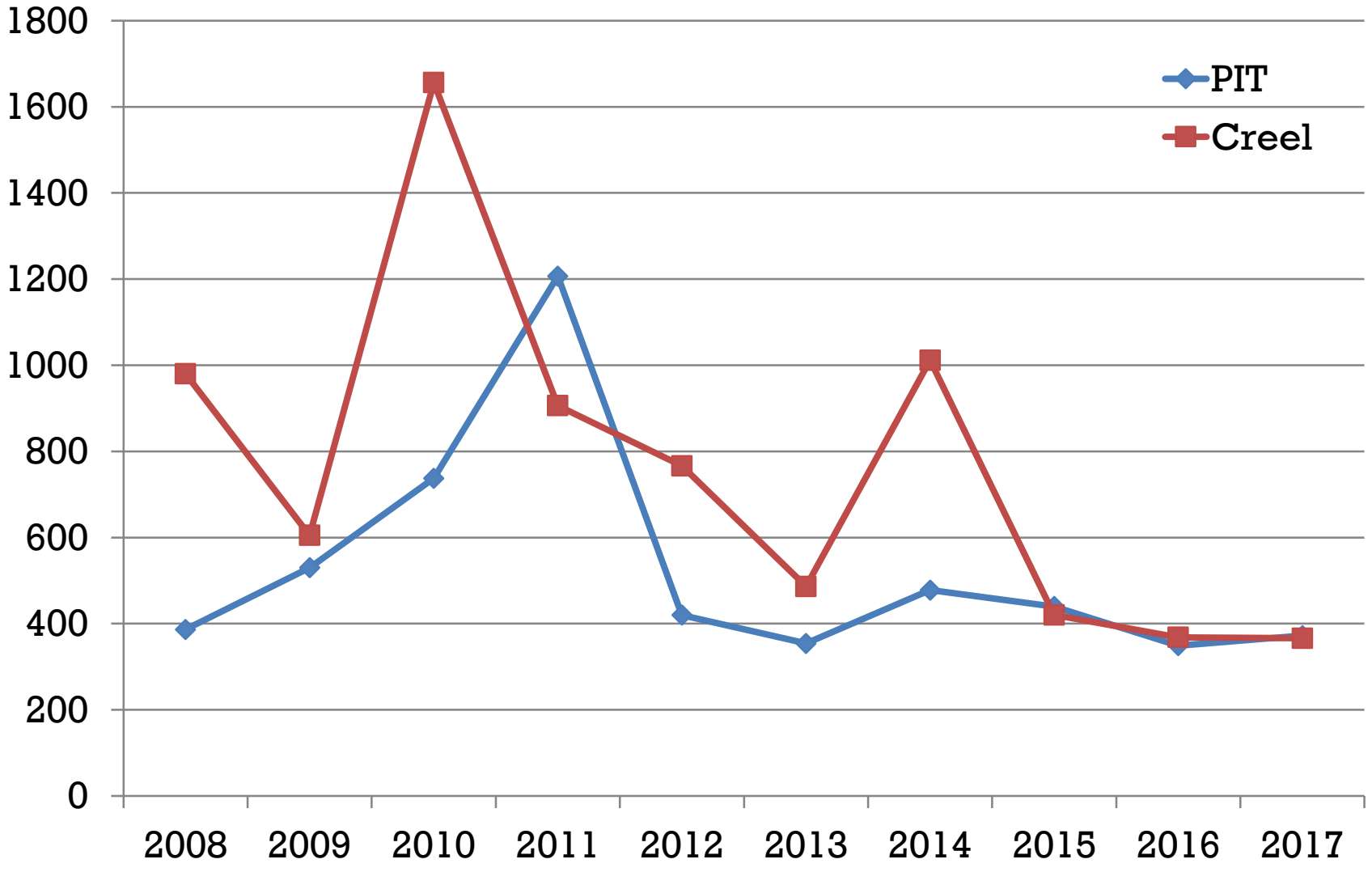
# Results – Prosser Dam Abundance



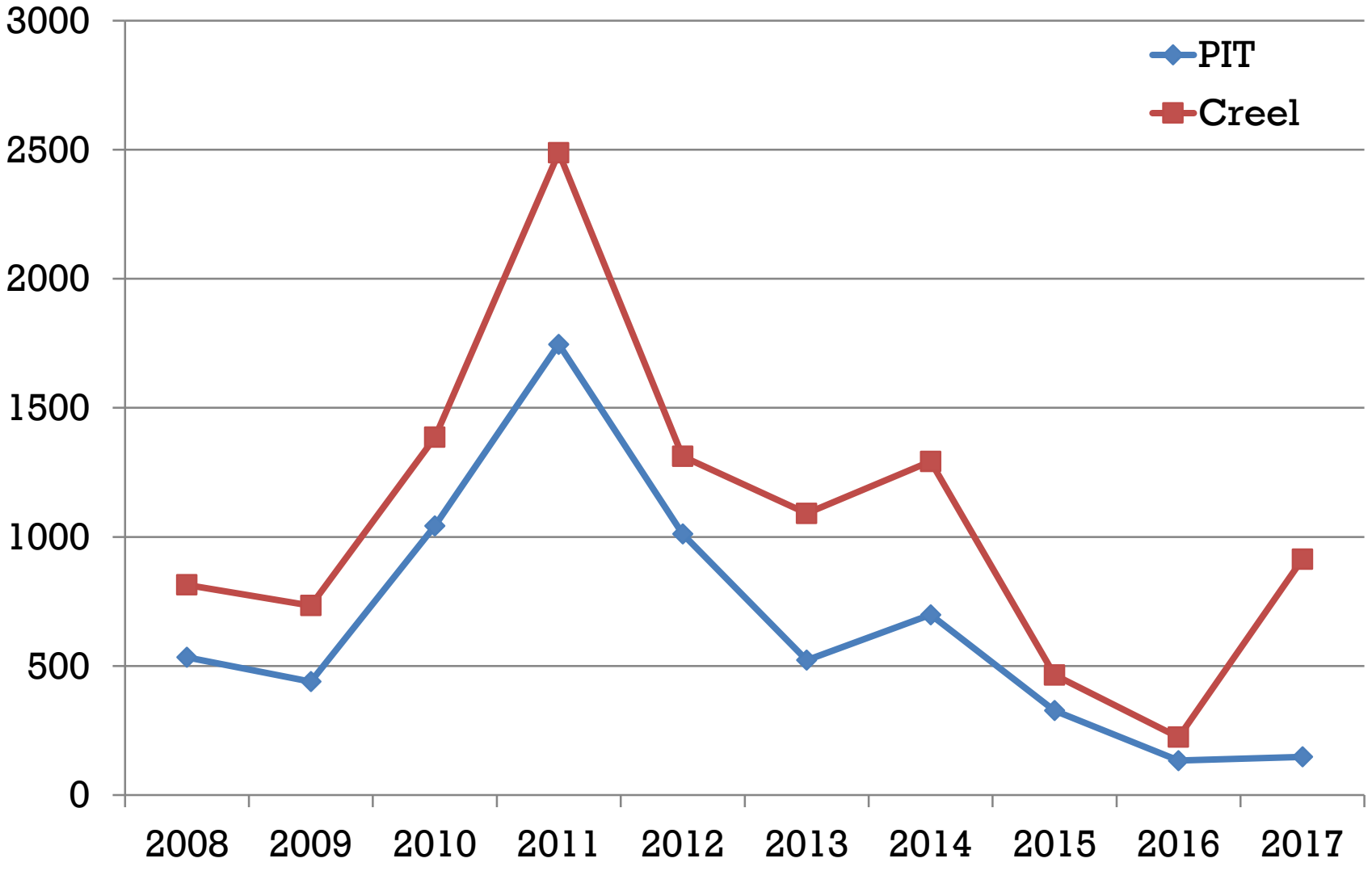
# Results – Roza Dam Abundance



# Results – Bonn. to McNary Harvest



# Results – Prosser to Roza Harvest



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Article

# Effects of Passive Integrated Transponder Tags on Smolt-to-Adult Recruit Survival, Growth, and Behavior of Hatchery Spring Chinook Salmon

Curtis M. Knudsen, Mark V. Johnston, Steven L. Schroder, William J. Bosch, David E. Fast, Charles R. Strom

First published: 08 January 2011 | https://doi.org/10.1577/M07-020.1 | Cited by: 18

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## Abstract

We tagged juvenile upper Yakima River hatchery spring Chinook salmon *Oncorhynchus tshawytscha* with passive integrated transponder (PIT) and coded wire snout tags in a double-tag study to test the assumptions that tags are not lost and do not affect postrelease survival, behavior, or growth. The average loss of PIT tags was 2.0% (95% confidence interval [CI] = 0.7–3.2%) in juveniles before release and 18.4% in recaptures returning 6 months to 4 years after release (95% CI = 17.2–19.5%). Adult tag losses were not significantly correlated with age of return (analysis of covariance, $P = 0.40$), indicating that the majority of PIT tag loss had occurred within the first 6 months after release. Smolt-to-adult recruit survival (SARS) of PIT-tagged fish was significantly lower ($P < 0.05$) than that of non-PIT-tagged (NPT) fish because of tag loss and reduced survival, resulting in an average underestimate of SARS of 25.0%. After correcting for tag loss, we estimated PIT tag-induced mortality to be as great as 33.3% with a mean of 10.3% over all brood years ($P < 0.05$). Mean lengths and weights of PIT-tagged adults were less than those of NPT adults in all age comparisons. However, only age-4 PIT-tagged adults were significantly smaller than NPT fish of the same age (mean length difference = 1.1 cm; mean body weight difference = 0.1 kg; analysis of variance, $P < 0.05$). There was no significant difference between migration timing of PIT-tagged and NPT adults within the upper Yakima River (Mann–Whitney test, $P > 0.09$). Given the widespread and increasing use of PIT tags, and their use in calculating critical estimators related to salmonid life history of Endangered Species Act populations, the effects of using PIT tags must be quantitatively considered under actual study conditions and, if necessary, be accounted for.

Related Information

### Metrics

Citations: 18

### Details



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Yakama Nation Fisheries

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# Summary

- Abundance differences [between methods] decrease as fish get closer to homing destination
- Trap count < Video count < Run Reconstruction
- Post-release PIT loss and PIT-induced mortality are important factors to consider
- Creel estimates look "reasonable" and may even be conservative

More info: Bill_Bosch@yakama.com