

TO: Fish Passage Advisory Committee (FPAC)

FROM: Nez Perce Tribe Department of Fisheries Resources Management and the Idaho Fish and Wildlife Conservation Office, U. S. Fish and Wildlife Service

REGARDING: Fall Chinook Salmon Fry Emergence Timing Downstream of Dworshak Dam – 2017 Update

DATE: March 18, 2017

This is an update to our September 26, 2016 memorandum on the timing of fall Chinook salmon fry emergence downstream of Dworshak Dam, specific to 2016/17 river temperatures. We focused on the Clearwater River lower reach that extends from the confluence of the North Fork Clearwater to the upper end of the east arm of Lower Granite Reservoir, and the North Fork Ahsahka Islands stretch that extends from Dworshak Dam to the Ahsahka Island complex situated at the mouth of the North Fork Clearwater River and the upper end of the Clearwater River lower reach.

### **Spatial Distribution of Redds**

Manned helicopter flights that covered the Clearwater River lower reach and the North Fork Ahsahka Island stretch were made on 09/28/2016, 10/10/2016, 10/24/2016, and 11/07/2016. Redds constructed after 11/07/2016 were not counted because scheduled flights were canceled due to inclement weather. However, redds constructed after the last flight on 11/07/2016 were estimated. To estimate potential redds missed on the mainstem Clearwater and N.F., we averaged previous 5 years' actual counts up to 07 November and calculated a percentage of overall redds counted to that date (average of 0.573), then applied that percentage to 1,900 to get an estimate of 3,316 redds, or 1,416 redds missed. We believe this is a conservative estimate since conditions were only "good" on 07 November and redds in deep water spawning areas were difficult to see.

Of the estimated total of 3,316 redds, 92.2% ( $n = 3,058$ ) and 7.8% ( $n = 258$ ) were estimated along the Clearwater River lower reach and the North Fork Ahsahka Islands stretch, respectively. Of the 258 redds estimated along the North Fork Ahsahka Islands stretch, 93.4% ( $n = 241$ ) were counted around the islands, and 6.6% ( $n = 17$ ) were estimated along the North Fork Clearwater River.

### **Mean Daily Water Temperature**

Mean daily temperature data were downloaded for the period 09/28/2016 to 03/05/2017 from the Spalding gauge located along the lower end of the Clearwater River lower reach. Plots of those data were compared to plots of mean daily temperature observed over the same period during

previous years. Mean daily temperatures during 09/28/2016 to 03/05/2017 were most similar to mean daily temperatures during 09/28/2008 to 03/05/2009. The mean daily temperatures for the periods 09/28/2016 to 03/05/2017 and 03/06/2009 to 06/01/2009 were combined to estimate fry emergence timing along the Clearwater River lower reach in 2017.

The amount of influence water released from Dworshak Dam has on developing embryos along the North Fork Ahsahka Islands stretch is dependent on where the redds are located. Redds located along the North Fork Clearwater River, and the north channel of the islands, are highly affected by Dworshak Dam operation compared to the redds located on southern, eastern, and western portions of the islands. The actual temperatures the embryos are exposed to have not been measured. For the purpose of this analysis, the redds were treated as one group and it was assumed that water temperature measured in the tailrace of Dworshak Dam represented the incubation temperatures in the redds.

Mean daily temperature data were downloaded from the Dworshak Dam water quality monitor for the period 09/28/2016 to 03/05/2017. The mean daily temperatures for the periods 09/28/2016 to 03/05/2017 and 03/06/2009 to 06/01/2009 were combined to estimate fry emergence timing along the North Fork Ahsahka Islands stretch.

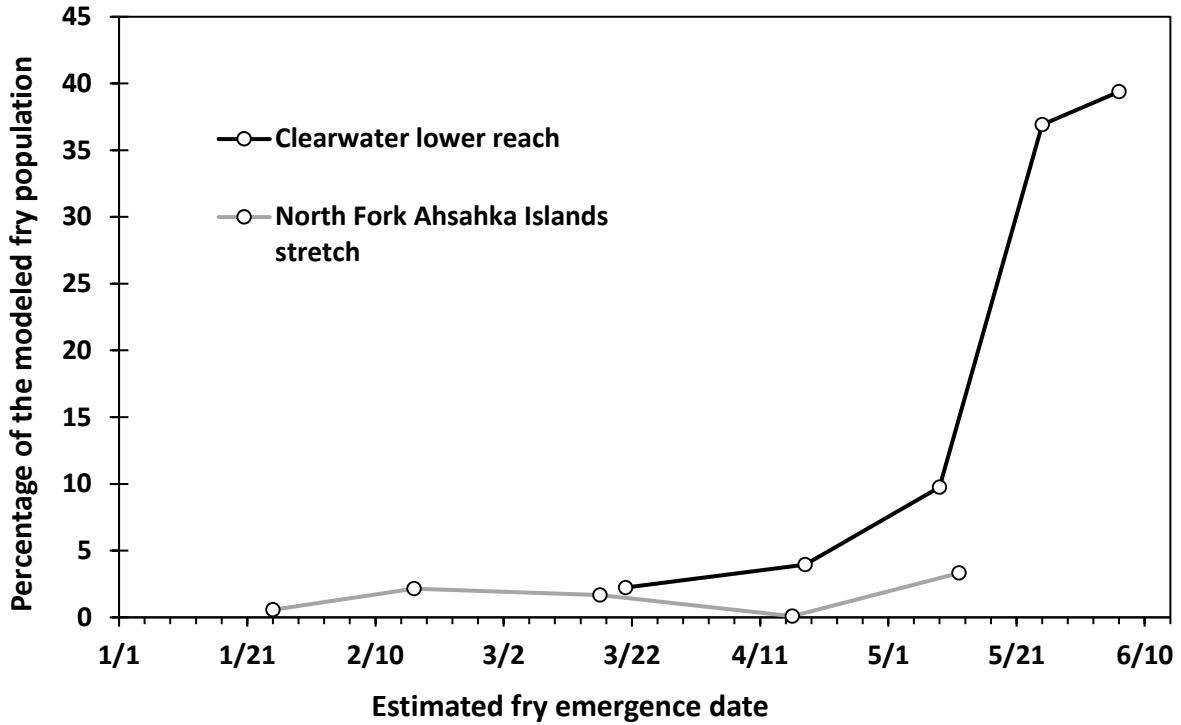
### **Fry Emergence Timing in 2017**

Emergence timing of fry was estimated separately for the Clearwater River lower reach and the North Fork Ahsahka Islands stretch by flight date. Starting on a given flight date, the daily mean water temperatures (°C) were summed forward in time until the date that 1,000 temperature units were accumulated (i.e., the estimated fry emergence date). The number of redds counted during a given flight over each of the two spawning locations was divided by the 2016 total redd count made downstream of Dworshak Dam. The resulting quotients were assumed to be directly proportional to the number of fry produced, and are referred to hereafter as “percentages of the modeled fry population.”

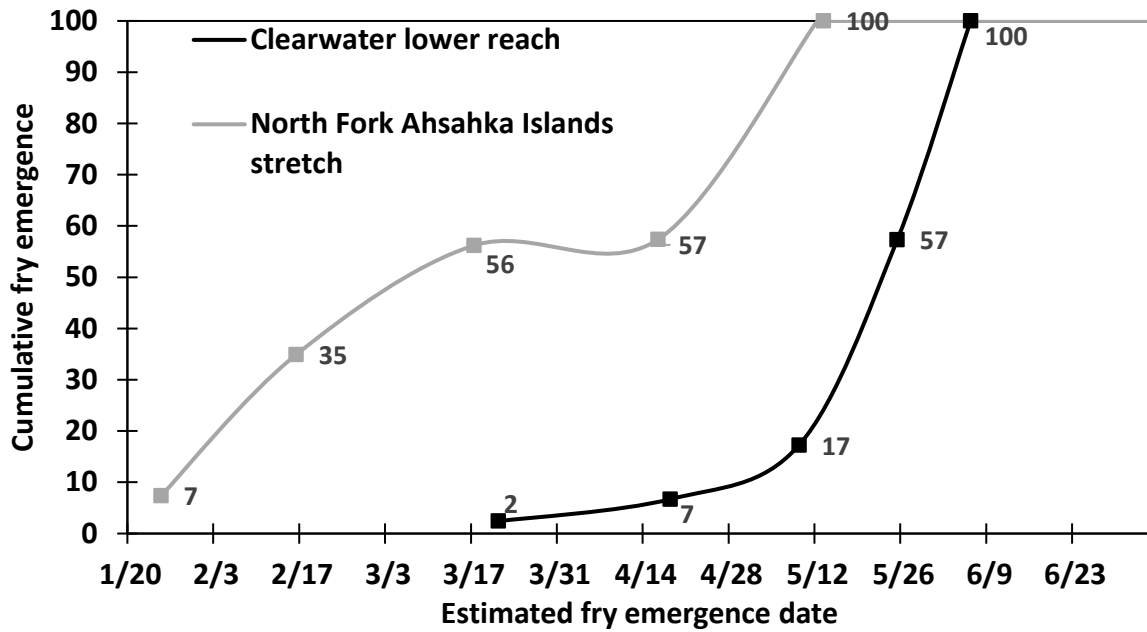
The percentages of the modeled fry population that were estimated to emerge from redds along the North Fork Ahsahka Islands stretch paired with estimated emergence dates were 0.6% on 01/25/2017 (the onset), 2.1% on 02/16/2017 (the peak), 1.7% on 03/17/2017, 0.1% on 04/16/2017 and 3.3% on 05/12/2017 (close to completion; Figure 1).

The percentages of the modeled fry population that were estimated to emerge from redds along the Clearwater River lower reach paired with estimated emergence dates were 2.2% on 03/21/2017 (close to the onset), 4.0% on 04/18/2017, 9.7% on 05/09/2017, 36.9% on 05/25/2017, and 39.4% on 06/06/2017 (close to completion; Figure 1).

Another view of the same fry emergence data as a cumulative percentage in each of the North Fork Ahsahka Islands stretch and the Clearwater River lower reach is presented in Figure 2.



**Figure 1.**—The percentage of the modeled fall Chinook salmon fry population downstream of Dworshak Dam (y axis) plotted against estimated dates of emergence from redds (x axis) counted along the Clearwater River lower reach, and the North Fork Ahsahka Islands stretch, 2017. (See the text for specific percentage-date pair values).



**Figure 2.**—The cumulative emergence fry percentage of the modeled fall Chinook salmon fry population downstream of Dworshak Dam (y axis) plotted against estimated dates of emergence from redds (x axis) counted along the Clearwater River lower reach, and the North Fork Ahsahka Islands stretch, 2017.