

2016 Snake River Fall Chinook Salmon Spawning Summary

by

Bill Arnsberg, Nez Perce Tribe

Brad Alcorn, Idaho Power Company

Frank Mullins, U.S. Fish and Wildlife Service

Debbie Milks, Washington Department of Fish and Wildlife

January, 2017

Fall Chinook Salmon redd surveys were conducted cooperatively by biologists from the Idaho Power Company (IPC), Nez Perce Tribe (NPT), U.S. Fish and Wildlife Service (USFWS), and Washington Department of Fish and Wildlife (WDFW). This was the 29th year that intensive, cooperative aerial surveys have been conducted in the Snake River and most major tributaries above Lower Granite Dam and 25th year for ground surveys in tributaries downstream of Lower Granite Dam. No underwater spawning surveys were conducted below any of the four lower Snake River dams during 2016. A total of 6,426 redds was estimated in the Snake River Basin during 2016 (Table 1), representing the third highest estimate since intensive surveys began in 1988. This year's redd estimate was 298 fewer redds than in 2014 and 2,920 fewer redds than in 2015 when a high of 9,346 redds was estimated. Due to safety concerns and to reduce risks of conducting weekly manned helicopter flights, the number of aerial surveys have been reduced to three or four flights for the last six years in most rivers.

Table 1. Number of fall Chinook Salmon redds in the Snake River Basin, 2016 (all manned helicopter counts except as noted, N/S = no survey).

Survey Area	Number of Redds
Snake River (sUAS)	1,486*
Snake River (underwater video)	486
Total Snake River	1,972*
Clearwater River	3,400*
Potlatch River	28
N.F. Clearwater River	17*
S.F. Clearwater River	108
M.F. Clearwater River	76
Selway River	102
Total Clearwater River Subbasin	3,731*
Grande Ronde River	415
Wallowa River	N/S
Wenaha River	N/S
Joseph Creek	N/S
Total Grande Ronde River Subbasin	415
Imnaha River	29
Salmon River	35
Tucannon River (ground count)	244*
Asotin Creek (ground count)	N/S
Alpowa Creek (ground count)	N/S
Below Lower Snake River dams (underwater video)	N/S
Grand Total Snake River Basin	6,426*

*estimated count.

During aerial and underwater video counts, IPC and USFWS staff observed an estimated total of 1,972 redds in the main stem Snake River (Table 1). This was the second year that surveys along the main Snake River were accomplished only with a small unmanned aircraft system (sUAS); no helicopter surveys were attempted. As such, the total shallow water redd number was estimated based on a sampling protocol established by IPC in cooperation with the USFWS and IMB Solutions in Moscow. For the sUAS survey samples, 36 individual sites were flown four times (every other week) during the spawning season, beginning the week of 24 Oct 2016, and ending during the week of 05 Dec 2016. The total number of new redds was compiled for each of the 36 sample sites, for each survey, and that provided a total number of redds present at each site that could be incorporated into our estimation model for the entire river (Table 2). Our sUAS sample surveys went well, except that visibility was reduced in the Snake River downstream of the Salmon River during all four weeks of the aerial survey. However, these same conditions would have compromised traditional helicopter methods, and we feel that the sUAS data collected still provided a good estimate that is comparable to what would have been observed through standard helicopter surveys. We also had one of our sUAS crash into the river during week 1 and lost data for 8 sites that week. The total number of redds observed at the 36 sample sites was 655, and the estimated total number of shallow redds within the main Snake River was 1,486. We estimated 444 (standard error 68.50) redds in the reach downstream of the Salmon River, and 1,042 (standard error 95.67) redds in the reach upstream of the Salmon River.

Spawning was estimated to have begun during mid-October (153 redds observed during the week of 24 October), appeared to peak in early November (386 new redds observed during the week of 07 November), declined the third week in November (60 new redds observed during the week of 21 November), and was determined to be complete by early December (56 new redds observed during the week of 05 December, the final sample surveys). All but 5 of these redds in the final week were downstream of the Salmon River where water clarity was much improved and allowed us to see deeper and more clearly than we had been able to during the first three surveys.

Intensive deepwater spawning searches were conducted throughout the main Snake River corridor, using remote underwater video cameras, in areas too deep to be viewed from the air. The deepwater searches began in mid-November, and were completed in early December. The deepwater searches located an additional 486 redds at 40 sites (65 sites were searched).

The flows from the Hells Canyon Dam were held stable at approximately 8,500 cfs throughout the spawning season. That flow has become the base flow that will be maintained through emergence.

For 2016, the total redd count for the Snake River was 1,972. During the most recent five years (2012 – 2016), the average number of redds occurring in the Snake River (including those found in deep water) has been 2,486, ranging between 1,828 and 3,155. The lowest redd count for the Snake River, since intensive, cooperative surveys began, was 46 redds in 1991, while the highest count is 3,155 redds observed last year (2015).

Table 2. Number of weekly new redds and season total redds counted at each sample site using the sUAS, Fall Chinook Salmon spawning season, Oct – Dec 2016.

River Mile	Week 1 New Redds	Week 2 New Redds	Week 3 New Redds	Week 4 New Redds	Total Redds
149.1	4	46	3	1	54
149.6	1	0	0	0	1
149.8	0	0	0	0	0
152.3	15	36	14	1	66
155.6	0	0	0	0	0
161.0	0	0	0	6	6
165.8	5	11	0	10	26
168.5	ND ¹	2	0	0	2
168.7	ND ¹	19	0	10	29
172.5	ND ¹	4	0	7	11
173.9	ND ¹	0	0	0	0
175.2	ND ¹	0	1	0	1
176.7	ND ¹	0	0	3	3
178.3	ND ¹	0	0	6	6
178.5	ND ¹	0	0	0	0
183.5	0	2	1	7	10
190.8	2	20	5	1	28
198.8	17	24	1	3	45
205.3	17	42	2	0	61
208.0	6	28	5	0	39
211.9	23	7	5	0	35
213.3	0	0	2	NF ²	2
215.4	2	6	5	0	13
216.1	3	7	0	NF ²	10
217.3	19	32	8	0	59
217.8	0	0	0	NF ²	0
218.7	6	28	2	0	36
220.8	2	14	0	1	17
221.0	0	0	0	0	0
223.2	4	17	2	0	23
226.7	2	10	0	0	12
227.2	0	0	0	0	0
236.0	5	11	0	NF ³	16
237.0	20	20	4	0	44
243.2	0	0	0	0	0
244.2	0	0	0	0	0
Total	153	386	60	56	655
<p>Week 1 = 24, 25, 26 Oct Week 2 = 7, 8, 9 Nov Week 3 = 21, 22, 23 Nov Week 4 = 5, 6, 7 Dec</p> <p>¹ Data lost – Crash/loss of sUAS and camera ² No flight - Time constraints ³ No flight - High winds</p>					

During traditional manned helicopter surveys, NPT staff estimated a total of 3,731 redds in the Clearwater River Subbasin (Table 1). Redd searches covered the entire Clearwater River from the Clearwater Paper Mill in Lewiston, Idaho to the forks of the South Fork and Middle Fork Clearwater rivers (71 miles), lower Potlatch River (4 miles), about one half mile of the lower North Fork Clearwater River above the mouth, the entire Middle Fork Clearwater River (22 miles), lower South Fork Clearwater River (14 miles), and lower Selway River (19 miles). This year we conducted an earlier 28 September survey on the Clearwater up to the S.F. Clearwater and the S.F. from the mouth up to Meadow Creek (Rm 33) with spring Chinook staff looking for spring Chinook redds mainly in the S.F. Clearwater. On the 28 September survey, we counted 87 redds in the lower Clearwater River up to the N.F. Clearwater, 6 redds in the N.F., and 11 redds in the S.F. Clearwater River. We attributed all redds to fall Chinook since live fish were present on most redds, therefore the initiation of redds began at least the third week in September. All 11 redds in the S.F. Clearwater were between Rm 18.5 to 19.6 which is above the normal index survey area (Rm 14 at the town of Harpster). Subsequent lower mainstem Clearwater River surveys on 10 October, 24 October, and 07 November resulted in 201, 375, and 1,227 new fall Chinook redds counted respectively. Potlatch River and the N.F. Clearwater rivers were surveyed on the same dates as the lower Clearwater. One and three new redds were counted in the N.F. on the October surveys for a total of 10 redds. No redds were observed on Potlatch River on both October surveys with 28 redds counted on the 07 November survey. Subsequent upper mainstem Clearwater River (from Orofino Creek upstream to the M.F. Clearwater) surveys conducted 12 October and 09 November resulted in zero and 58 redds observed, respectively, for a total of 1,948 redds in the entire mainstem Clearwater. Due to rains and turbid water, a scheduled 21 November final survey on the Clearwater River was not conducted. 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 1,958 to get an estimate of 3,417 redds, or 1,469 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.

The M.F. Clearwater, Selway, and S.F. Clearwater rivers were surveyed on 12 October and 09 November. On the M.F. Clearwater River, we observed 9 and 67 new redds, respectively, for a total of 76 redds (Table 1). On the Selway River, we observed 62 and 40 new redds, respectively, for a total of 102 redds. On the S.F. Clearwater River, we observed 11 and 86 new redds, respectively, on the two survey dates. Including 11 redds counted on the extended 28 September survey, there were 108 total redds counted on the S.F. Clearwater. The last 09 November S.F. survey was extended up to Mount Idaho Grade in which 52 new redds were counted, therefore, a total of 63 of the 108 redds counted in the S.F. were above Harpster in the extended search area. We may have missed a few redds in the upper Clearwater tributaries since 09 November was the last survey date, however, missed redds were not estimated.

This year's estimate of 3,731 redds in the Clearwater River Subbasin was the second highest redd count and/or estimate since aerial surveys began in 1988 and 1,351 redds less than the record count during 2015. Survey conditions were excellent on the first survey, good on the second survey, declined to only fair on the third survey and was good on the last survey on lower mainstem Clearwater. Excellent to good survey conditions prevailed on the upper Clearwater,

M.F. Clearwater, S.F. Clearwater, and Selway rivers. Since we conducted the last scheduled survey on 09 November in the M.F. Clearwater, S.F. Clearwater and Selway rivers, not many redds were thought to have been missed.

Throughout the fall Chinook Salmon spawning period, Dworshak Reservoir discharges remained stable at 1,600 cfs. Flows on the lower Clearwater (USGS Gauging Station at Spalding, ID) began with a low of 3,100 cfs on 28 September, increased to 4,210 and 6,740 cfs, and decreased to 6,280 cfs on subsequent surveys. During 2016, we observed redds in areas on the mainstem Clearwater, S.F. Clearwater, M.F. Clearwater, and Selway rivers where no redds had been previously recorded. Since 2012, the mean number of redds occurring in the Clearwater River Subbasin has been 3,369 ranging between 1,958 in 2012 and 5,082 in 2015. The lowest redd count for the Clearwater River Subbasin, since intensive surveys began was 4 redds in both 1990 and 1991, while the highest count was 5,082 redds in 2015.

Two manned aerial surveys conducted by NPT staff on the Grande Ronde River resulted in a total of 415 redds observed (Table 1). Surveys on 03 November and 21 November resulted in 258 and 157 new redds counted, respectively. Due to inclement weather, a scheduled survey on 19 October was not conducted. Redd surveys covered the mouth up to the Wildcat Bridge just past the town of Troy (53 miles). An extended survey covering the upper Grande Ronde River up to the Wallowa River, lower Wallowa River, and lower Wenaha River was not conducted this year. We did not receive any reports of spawning fall Chinook in Joseph Creek on the lower Grande Ronde. Redds were observed in 53 distinct spawning locations on the Grande Ronde. Survey conditions were fair on the first survey and good on the last survey, therefore, not many redds were thought to have been missed. Flows were a moderate 1,530 cfs (USGS Gauging Station at Troy, OR) on the first survey decreasing to 1,220 cfs on the last survey. Since 2012, the mean number of redds counted in the Grande Ronde River Subbasin has been 341, ranging from 255 to 415. The lowest redd count for the Grande Ronde Subbasin since intensive surveys began, was zero in 1989 and 1991, while the highest count was 415 in 2016.

Two manned aerial surveys were conducted by NPT staff on the Imnaha River on the same dates as the Grande Ronde resulting in 29 redds observed (Table 1). Surveys were conducted from the mouth up to the town of Imnaha (19 miles). Surveys on 03 November and 21 November resulted in 18 and 11 new redds counted, respectively. Survey conditions were good on the first survey and only fair on the last survey, therefore, some redds may have been missed. Flows were 275 cfs on the first survey and 276 cfs on the last survey at Imnaha, OR this year (Idaho Power Company stream flow website). Redds were constructed in 12 distinct locations. Since 2012, the mean number of redds observed in the Imnaha River has been 68, ranging from 29 to 103. The lowest redd count for the Imnaha River, since intensive surveys began, was zero redds in 1994 while the highest count was 132 in 2010.

One manned aerial survey conducted 08 December by NPT staff on the Salmon River resulted in 35 redds observed (Table 1). Due to rains and turbid water, scheduled surveys on 31 October and 22 November were not conducted. The survey was conducted from the mouth up to French Creek (105 miles). Redds were constructed in 6 distinct locations. Salmon River flow was moderate at 3,790 cfs (USGS Gauging Station at Whitebird, ID) during the survey and conditions were only good but not excellent, therefore, a few deep water redds were probably

missed. Since 2012, the mean number of redds occurring in the Salmon River has been 57, ranging between 31 and 142. The lowest redd count for the Salmon River, since intensive surveys began in 1992, was zero redds in both 1999 and 2000, while the highest count was 142 in 2015.

Due to rains and turbid water during mid-November, a ground survey of lower Alpowa Creek was not conducted this year. A total of 31 redds were observed by NPT staff in the lower Alpowa Creek in 2010, the first year surveyed, while no redds were seen in 2011, and 6 redds observed in 2012. Due to late rains and turbid conditions, surveys have not been conducted since 2012.

Due to cold weather during November and high turbid waters in December, WDFW staff periodically conducted ground surveys on the lower 20.8 miles of the Tucannon River. The lowest 8.0 miles of the Tucannon River were surveyed from 24 October until 02 December, during the time when 85% of the redds were historically built. Going upstream, the next 6.1 miles were surveyed until 18 November, when 70% of the redds were historically built. The furthest upstream reaches of fall Chinook spawning area was 6.6 miles long and was surveyed until 2 December, covering the full time redds were historically built. Overall, surveys covered 92.3% of the lower 20.8 miles of the Tucannon River from 24 October until 02 December. Sections with restricted access were estimated using counts from adjacent sections, and adjustments were made for weeks the surveys were not performed based on proportions of redds built in the same time frame in prior years. In 2016, staff counted 202 fall Chinook redds which expand to 244 after all adjustments were made (Table 1). The first redds were observed on 24 October and the peak of spawning occurred during the week of 07 November. Prior to the high flow events, visibility was excellent due to low flows. Since 2012, the mean number of redds in the Tucannon was 396, ranging from 244 to 541. The lowest redd count for the Tucannon River was 16 redds in 1987 and the highest estimate was 541 redds in 2012.

No spawning ground surveys were conducted in the lower Asotin Creek during 2016. WDFW staff counted 53 redds in the lower 3.1 miles of Asotin Creek during 2014, which was the highest redd count since surveys began. The second highest count was 30 redds in 2012.

Similar to 2015, there were no underwater camera surveys conducted below any of the four lower Snake River dams during 2016 (Hockersmith, USACE personal communication). Past underwater video results showed no fall Chinook redds below Ice Harbor Dam, the only dam surveyed, in 2014. Normandeau Associates, Inc surveyed areas around the juvenile collection facility below Lower Granite Dam and observed 5 redds in 2013. Previous fall Chinook redd surveys have been intermittent based on funding during recent years, typically not all dams were surveyed, and redds numbers tended to be low. There were no surveys conducted in either 2010 or 2012. There were 10 redds observed by Battelle Pacific Northwest Laboratory below Lower Monumental Dam during 2011, the only dam surveyed that year. During 2008, areas below all lower Snake River dams were surveyed by Battelle with no redds observed below Ice Harbor and Little Goose, 7 redds counted below Lower Monumental, and 8 redds counted below Lower Granite.

Final results will be provided in annual reports to Bonneville Power Administration. Past reports can be found at www.bpa.gov. Past reports below the lower Snake River dams can be obtained through the U.S. Army Corps of Engineers, Walla Walla District.