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To: Joelene Boyd, The Nature Conservancy
From: Rich Henderson, Skagit River System Cooperative
Date: May 4, 2016
Re: Fisher Slough Technical Memo, Results for all fish by areas within the Fisher Slough Project during the 2015 monitoring period as stipulated in Contract WA-C-150106-034, Task 5D-2015-Fish Technical Memo.

This technical memo gives the results of the fish species captured in 2015 and includes a brief summary of the salmonid species captured. Figure 1 shows the location of sample site groupings referred to in this report.

Fish monitoring at Fisher Slough was conducted from February 10 through August 18, 2015. The fish sampling methods and site selection are described in detail in Beamer et al. (2013). The sampling protocol set forth in that document states that it consists of two days in a two-week period to complete a sampling event. This includes Day 1: sample fyke trap, main channel sites including Blind Ch 3 and Tom Moore Sl Upper Area, starting at high tide; Day 2: sample Blind Ch 1 and 2 starting at low slack and first portion of flood tide.

This method was adhered to February 10 to May 11, 2015, except for April 13 when the WSE got too low in Blind Ch 1 for adequate sampling and the job was completed April 14.

Low water conditions in the Skagit River and its tributaries during 2015 necessitated adaptive management in the sampling protocol. On May 11, fish sampling was scheduled in blind channel lobes but again there was not enough water to sample in. Even though the crew waited for high tide, there was minimal water in Blind Ch1. The available sample area was limited to the excavated channel and flooded habitat within approximately 50 meters either side of the channel. Water depth over the marsh surface was 0.2 to 0.3 meters. Blind Ch 2 had a bit more water in it but the water was contained to the center of the lobe. Sampling proceeded that day under these conditions.

Starting with the May 19 sampling, all areas were sampled on the same day. The crew would set the fyke trap, sample in the main channel area, then sample in the blind channel lobes. This strategy was continued until the end of fish monitoring August 18.

During the summer, vegetation abundance and height also played a part in the sampling plan. Sample sites randomly selected by computer could not always be sampled due to too much vegetation. New sample areas were chosen on site that had less than 50% of the area seined containing vegetation. More vegetation would make for ineffective seining as the lead line would ‘roll up’ over the top of the plants and allow fish to escape. The location

of each set was recorded by GPS and a corresponding site name was determined in the office.

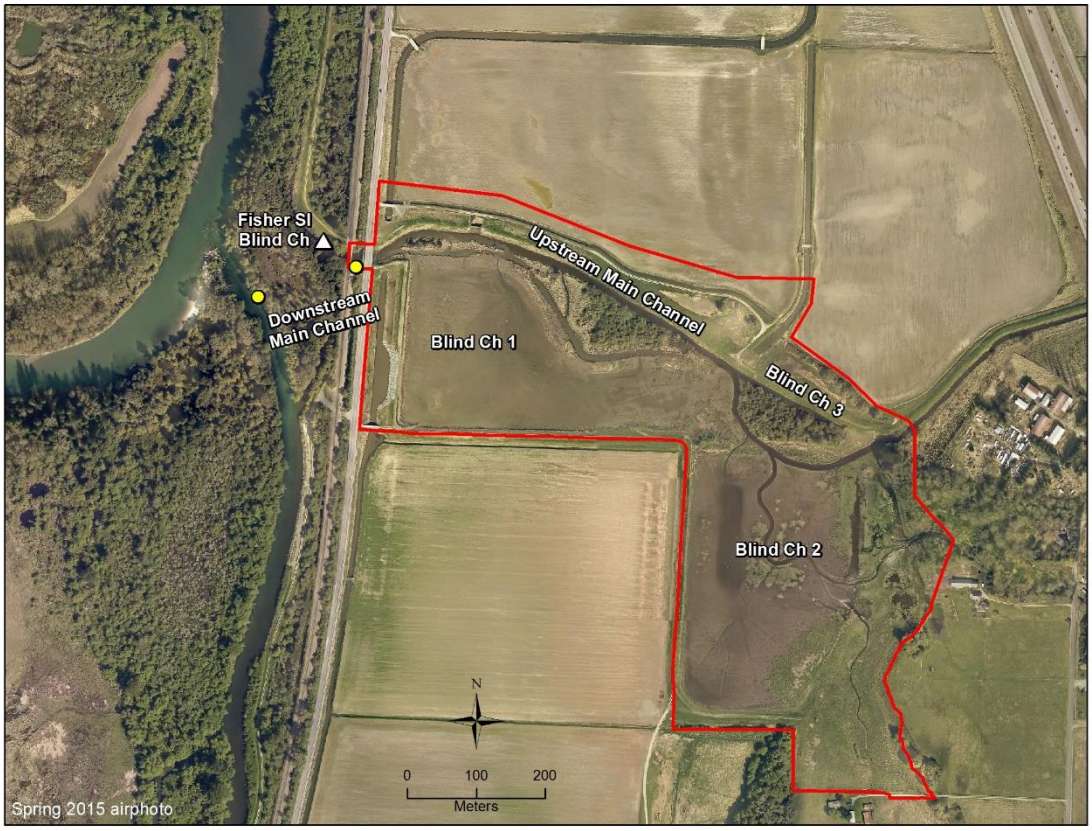


Figure 1. Location of sample site groupings at Fisher Slough used for the 2015 monitoring.

Fish assemblage

There were 11,921 fish representing 19 fish species found in the sampling at Fisher Slough from February 10 to August 18, 2015. The catch for all species is shown in Table 1.

Table 1. Total catch by species at Fisher Slough sites February 10 through August 18, 2015. Mean catch per unit effort (beach seine set or fyke trap daily catch) is in parentheses.

Gear:	beach seine					fyke trap
Strata:	Upstream of floodgate				Downstream of floodgate	
Strata2:	Blind Ch 1 sites	Blind Ch 2 sites	Blind Ch 3 sites	Main channel sites	Main channel sites	Fisher Sl Blind Ch
Salmonid species:						
Chinook salmon, unmarked subyearling *Oncorhynchus tshawytscha*	132 (1.83)	97 (1.35)	10 (0.42)	73 (1.52)	191 (5.31)	31 (2.58)
Chinook salmon, hatchery origin, all marks and ages combined Oncorhynchus *tshawytscha*	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.03)	0 (0.00)
Coho salmon, unmarked subyearling *Oncorhynchus kisutch*	10 (0.14)	91 (1.26)	66 (2.75)	26 (0.54)	42 (1.17)	35 (2.92)
Coho salmon, unmarked yearling *Oncorhynchus kisutch*	1 (0.01)	14 (0.19)	4 (0.17)	10 (0.21)	2 (0.06)	3 (0.25)
Coho salmon, hatchery origin yearling, all marks combined *Oncorhynchus kisutch*	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (0.11)	0 (0.00)
Chum salmon subyearling *Oncorhynchus keta*	11 (0.15)	17 (0.24)	2 (0.08)	0 (0.00)	13 (0.36)	4 (0.33)
Cutthroat trout, all ages *Oncorhynchus clarkii*	2 (0.03)	4 (0.06)	14 (0.58)	7 (0.15)	6 (0.17)	3 (0.25)
Native Char, all ages Salvelinus sp. (malma or confluentus	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.02)	1 (0.03)	0 (0.00)
Steelhead salmon, unmarked yearling *Oncorhynchus mykiss*	0 (0.00)	0 (0.00)	1 (0.04)	1 (0.02)	0 (0.00)	0 (0.00)
Unidentified trout, subyearling *Oncorhynchus mykiss or clarkii*	0 (0.00)	0 (0.00)	1 (0.04)	0 (0.00)	0 (0.00)	0 (0.00)
Whitefish, all ages *Prosopium williamsoni*	1 (0.01)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.03)	1 (0.08)
Total salmonids:	**157**	**223**	**98**	**118**	**261**	**77**
Other fish species:						
Three-spine stickleback *Gasterosteus aculeatus*	678 (9.42)	4990 (69.31)	535 (22.29)	281 (5.85)	10 (0.28)	503 (41.92)
Peamouth chub *Mylocheilus caurinus*	240 (3.33)	2341 (32.51)	78 (3.25)	10 (0.21)	7 (0.19)	376 (31.33)
Redside shiner *Richardsonius balteatus*	0 (0.00)	0 (0.00)	2 (0.08)	0 (0.00)	1 (0.03)	1 (0.08)
Prickly sculpin *Cottus asper*	5 (0.07)	0 (0.00)	7 (0.29)	10 (0.21)	17 (0.47)	480 (40)
Pacific staghorn sculpin *Leptocottus armatus*	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.02)	0 (0.00)	0 (0.00)
Starry flounder *Platichthys stellatus*	1 (0.01)	7 (0.01)	3 (0.13)	3 (0.06)	28 (0.78)	1 (0.08)
Pumpkinseed *Lepomis gibbosus*	1 (0.01)	19 (0.263)	72 (3.00)	3 (0.06)	0 (0.00)	68 (5.67)
Blue gill *Lepomis macrochirus*	11 (0.15)	44 (0.61)	51 (2.13)	10 (0.21)	0 (0.00)	8 (0.67)
Unidentified juvenile sunfish	4 (0.06)	3 (0.04)	8 (0.33)	0 (0.00)	0 (0.00)	0 (0.00)
Largescale sucker *Catostomus macrocheilus*	14 (0.19)	13 (0.18)	7 (0.29)	1 (0.02)	0 (0.00)	2 (0.17)
Fathead minnow *Pimephales promelas*	0 (0.00)	0 (0.00)	1 (0.04)	0 (0.00)	0 (0.00)	0 (0.00)
Yellow perch *Perca flavescens*	3 (0.04)	10 (0.14)	4 (0.17)	0 (0.00)	0 (0.00)	11 (0.92)
Lamprey *Lampetra spp.*	0 (0.00)	1 (0.01)	0 (0.00)	0 (0.00)	1 (0.03)	1 (0.08)
Total other fish species:	**957**	**7,428**	**768**	**319**	**64**	**1,451**
Total Catch:	**1,114**	**7,651**	**866**	**437**	**325**	**1,528**

Subyearling wild Chinook salmon

Upstream of the floodgate

Subyearling wild Chinook salmon were present in Fisher Slough upstream of the floodgate when sampling started in February and were found in all areas at that time. The peak density for the upstream floodgate area occurred in Blind Ch 1 in April, with a monthly average density of 784 fish per hectare of area seined (Figure 2). The peak density for each of the four sample areas upstream of the floodgate also occurred in April. During the fish monitoring in June, Chinook salmon were only found in the main channel areas. Subyearling wild Chinook salmon were not found in blind channel lobes from June through August in 2015.

Downstream of the floodgate

Subyearling wild Chinook salmon were also present in Fisher Slough downstream of the floodgate when sampling started in February and were found in all areas at that time. The peak density for the downstream floodgate area occurred in February, with a monthly average density of 3,806 fish per hectare of area seined (Figure 2). During the fish monitoring in June, Chinook salmon were only found in the main channel areas downstream of the floodgate. Subyearling wild Chinook salmon were not found in any of the sites downstream of the floodgate during July and August.

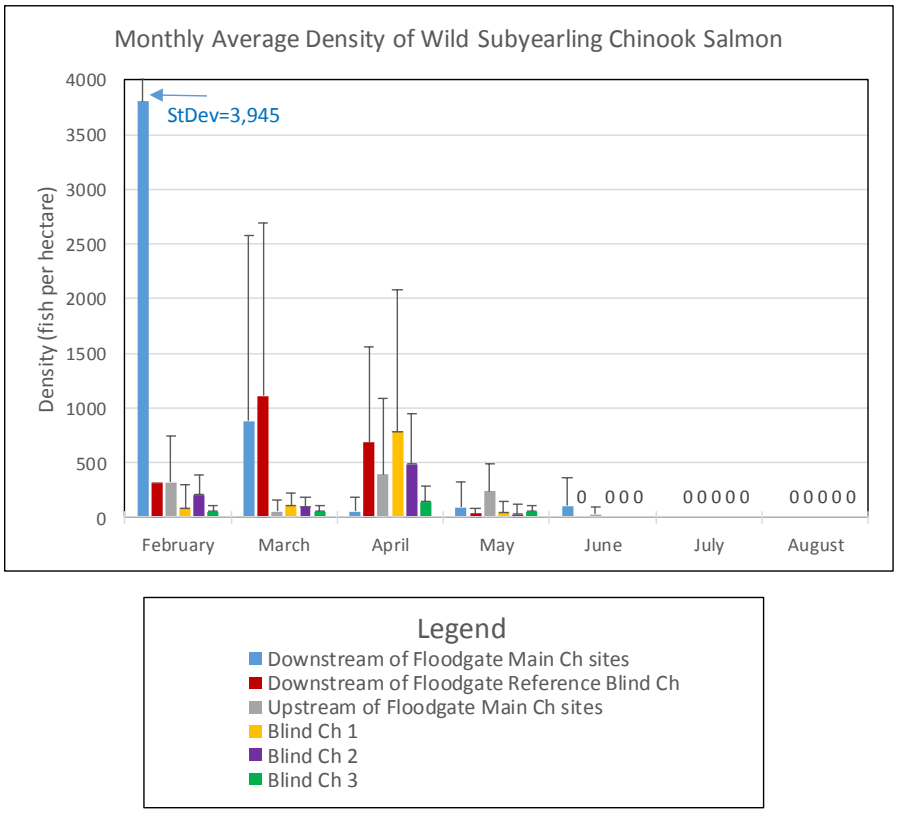


Figure 2. Comparison of the monthly average density of wild subyearling Chinook salmon found in the combined upstream main channel sites, the blind channel sites, the combined downstream main channel sites and the reference blind channel site at Fisher Slough in 2015. Error bars are one standard deviation. There was only one sampling event in February, hence there is no error bar for that month at Downstream of Floodgate Reference Blind Ch.

Yearling coho salmon

Upstream of the floodgate

Yearling coho salmon were present in Fisher Slough upstream of the floodgate when sampling started in February but were found only in Blind Ch 1 and Blind Ch 2 at that time. The peak density for the upstream floodgate area occurred in main channel sites in May, with a monthly average density of 117 fish per hectare of area seined (Figure 3, panel A). Coho salmon were not found in any of areas upstream of the floodgate during the sampling in June through August.

Downstream of the floodgate

Yearling Coho salmon were only found downstream of the floodgate in April and May. The peak abundance was 68 fish per hectare at the Reference Blind Ch site occurring in April (Figure 3, panel A).

Subyearling coho salmon

Upstream of the floodgate

Coho salmon fry were found in beach seine catches upstream of the floodgate starting in March but were only found in Blind Ch 3 during that month (Figure 3, panel B). In April and May they were found in all four areas. The peak monthly average density was in July and located in Blind Ch 3 with 755 fish per hectare of area seined (Figure 3, panel B). Subyearling coho salmon were not found in any of the areas upstream of the floodgate during August.

Downstream of the floodgate

Subyearling coho salmon were found at sites downstream of the floodgate starting in April at Reference Blind Ch and in June at the main channel sites (Figure 3, panel B). The peak monthly average density occurred in July with an average of 376 fish per hectare of area sampled at the Reference Blind Ch site. Coho salmon fry were still present when sampling stopped in August with a monthly average density of 218 fish per hectare in the main channel sites (Figure 3, panel B).

Chum salmon

Upstream of the floodgate

Chum salmon were observed upstream of the floodgate in April and May although they were only found at Blind Ch 2 in May. The peak density was in April in Blind Ch 2 with a monthly average density of 129 fish per hectare of area seined. Chum salmon were not found during February, March, June, July or August, nor were they found in main channel sites upstream of the floodgate (Figure 4, panel A).

Downstream of the floodgate

Chum salmon were found downstream of the floodgate when sampling started in February through the month of June in 2015. The peak density was in March with a monthly average of 159 fish per hectare of area sampled in Reference Blind Ch (Figure 4, panel A). They were not found at sites downstream of the floodgate in July and August.

Cutthroat trout

Cutthroat trout were present in the catch upstream of the floodgate every month during sampling except February and June. The peak catch was in April in Blind Ch 3 with a monthly average density of 341 fish per hectare of area seined. Cutthroat trout were found downstream of the floodgate in April, May and August. Downstream of the floodgate, the peak density of cutthroat trout was 71 fish per hectare of area sampled, occurring in April at the Reference Blind Ch site (Figure 4, panel B).

Hatchery-origin salmon

There was one hatchery-origin Chinook salmon caught at Fisher Slough in 2015 and it was found downstream of the floodgate during July. It was sacrificed in order to read the Coded Wire Tag (CWT) located in its snout and it was determined that it was summer stock Chinook released from the WDFW hatchery at Marblemount on the Skagit River.

There were four hatchery-origin coho and all were found downstream of the floodgate in May. Three of the hatchery coho were marked with an adipose fin clip only. The fourth was a CWT tagged fish and it was sacrificed to read the tag. It was determined that the fish was released from the WDFW hatchery at Marblemount on the Skagit River.

Steelhead

Two juvenile yearling steelhead salmon were found during sampling in 2015. Both were captured upstream of the floodgate in April with one being found in the main channel sites and the other in Blind Ch 3.

Native char

Two native char were found during sampling in 2015. One was caught downstream of the floodgate in the main channel sites in June and the other caught upstream of the floodgate at the main channel sites in July.

Whitefish

Three white fish were found during sampling in 2015. Two were caught in April at Reference Blind Ch downstream of the floodgate (n=1) and at Blind Ch 1 upstream of the floodgate (n=1). The third white fish was sampled in June in the main channel areas downstream of the floodgate.

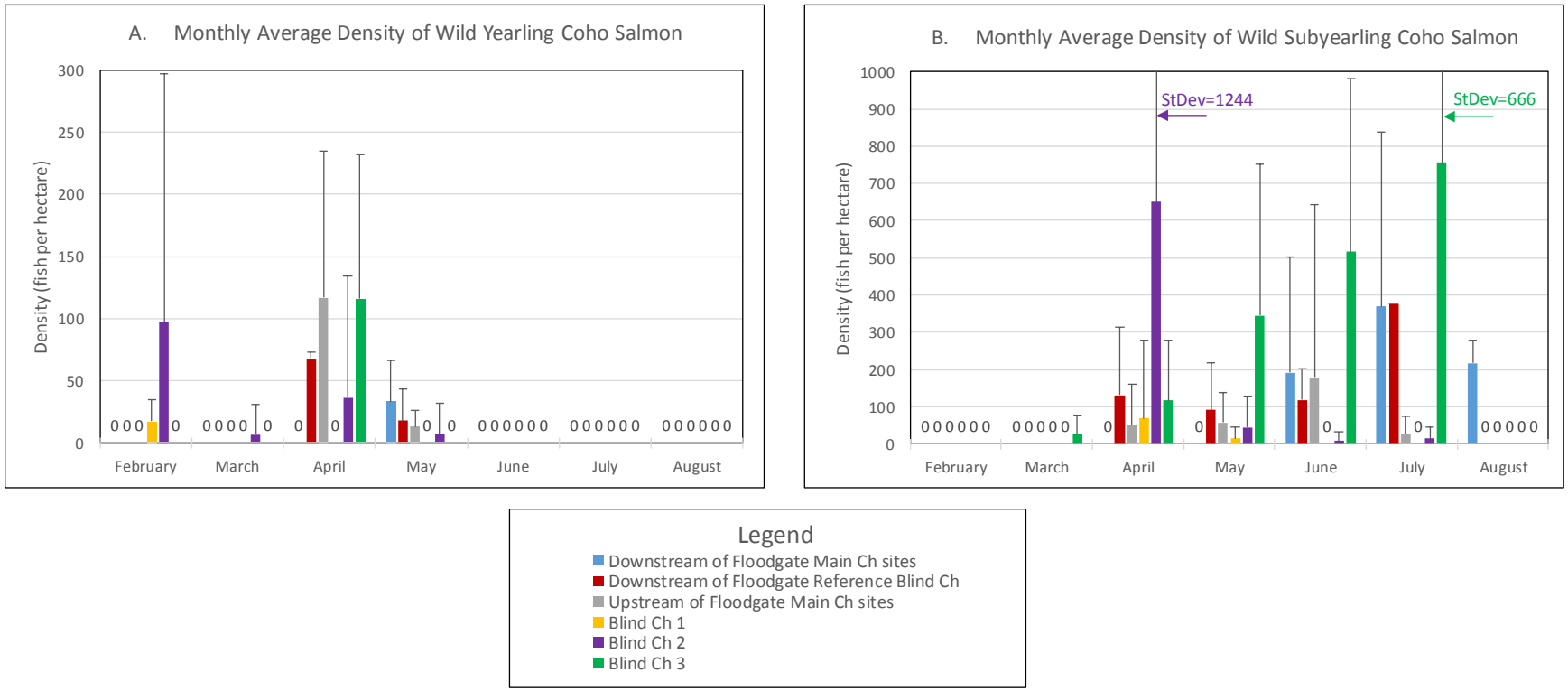
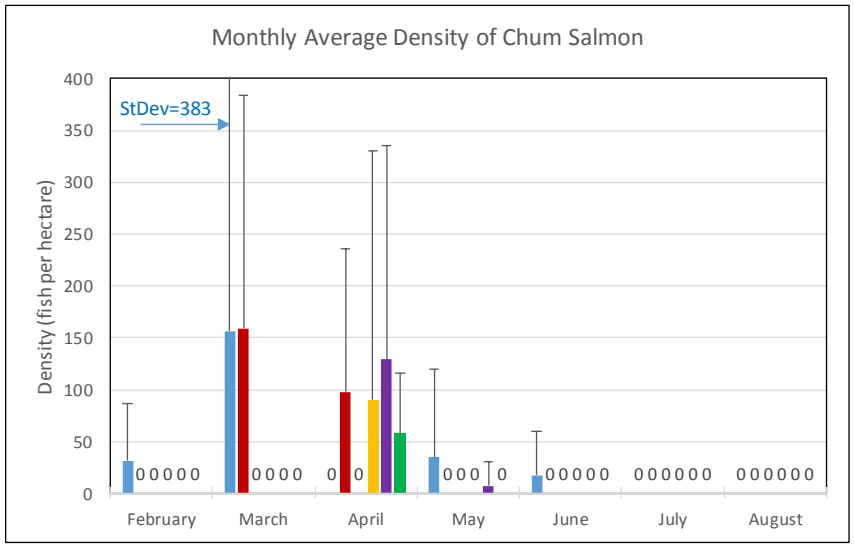
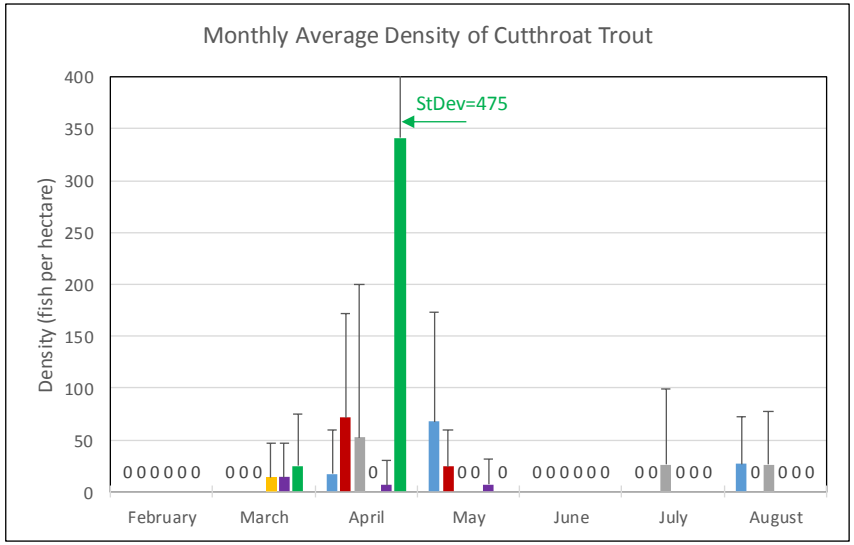


Figure 3. Comparison of the monthly average density of coho salmon found in the combined upstream main channel sites, the blind channel sites, the combined downstream main channel sites and the reference blind channel site at Fisher Slough in 2015. Error bars are one standard deviation. Note the different scales on the y axes.





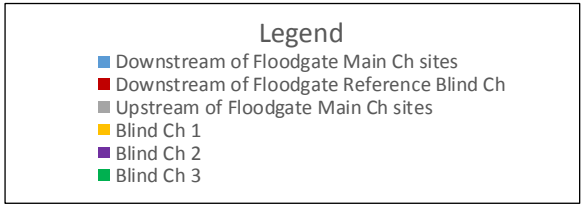


Figure 4. Comparison of the monthly average density of chum salmon and cutthroat trout found in the combined upstream main channel sites, the blind channel sites, the combined downstream main channel sites and the reference blind channel site at Fisher Slough in 2015. Error bars are one standard deviation.

References

Beamer, E., R. Henderson, and K. Wolf. 2013. Juvenile salmon, estuarine, and freshwater fish utilization of habitat associated with the Fisher Slough Restoration Project in 2012. Report prepared for The Nature Conservancy, Washington. Available at www.skagitcoop.org.