



**A GENETIC ANALYSIS OF THE SUMMER STEELHEAD STOCK
COMPOSITION IN THE COLUMBIA RIVER AND THE SNAKE
RIVER TRIBAL AND SPORT FISHERIES**

JUNE 16, 2017 to DECEMBER 31, 2017

Prepared by:

**Alan Byrne, Idaho Department of Fish and Game
Joe Hymer, Pacific States Marine Fisheries Commission
Stuart Ellis, Columbia River Inter-Tribal Fish Commission
Roger Dick II, Yakama Nation
Ken Keller, Pacific States Marine Fisheries Commission
Craig A. Steele, Pacific States Marine Fisheries Commission
Megan Begay, Yakama Nation
Todd Miller, Washington Department of Fish and Wildlife**

**IDFG Report Number 18-108
October 2018**

SUMMER STEELHEAD STOCK COMPOSITION IN THE COLUMBIA RIVER AND SNAKE RIVER TRIBAL AND SPORT FISHERIES

JUNE 16, 2017 to DECEMBER 31, 2017

Alan Byrne^a, Joe Hymer^b, Stuart Ellis^c, Roger Dick II^d, Ken Keller^b, Craig A. Steele^e, Megan Begay^d, Todd Miller^f

^a Idaho Department of Fish and Game
600 South Walnut Street
Boise, ID 83707

^b Pacific States Marine Fisheries Commission
5525 South 11th Street
Ridgefield, WA 98642

^c Columbia River Inter-Tribal Fish Commission
700 NE Multnomah, Suite 1200
Portland, OR 97232

^d Yakama Nation
PO Box 151
Toppenish, WA 98948

^e Pacific States Marine Fisheries Commission
Eagle Genetics Lab
1800 Trout Road
Eagle, ID 83616

^f Washington Department of Fish and Wildlife
401 South Cottonwood Street
Dayton, WA 99328

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	vi
ABBREVIATIONS AND ACRONYMS	vii
ABSTRACT.....	1
INTRODUCTION	2
METHODS.....	3
Steelhead Passage at Bonneville, McNary and Ice Harbor Dams.....	3
Steelhead Run-Timing at Bonneville and McNary dams	4
Lower Columbia River Sport Harvest Estimates	4
Columbia River Upstream of Bonneville Dam Sport Harvest Estimates	5
Lower Snake River Sport Harvest Estimates	5
Columbia River Tribal Zone 6 Harvest Estimates	5
Sample Collection in the Lower Columbia River Sport Fishery	6
Sample Collection in the Columbia River Upstream of Bonneville Dam Sport Fisheries	6
Sample Collection in the Lower Snake River Sport Fishery	6
Sample Collection in the Columbia River Zone 6 Tribal Fishery.....	6
Estimating Composition Proportions And Harvest Contribution of Steelhead.....	7
Confidence Intervals For Group, Stock, and Basin Proportions	9
Sex, Fish Length and Ocean Age Percentages	9
RESULTS	10
Steelhead Passage at Bonneville, McNary and Ice Harbor Dams.....	10
Steelhead Run-Timing at Bonneville and McNary dams	10
Lower Columbia River Sport Harvest Estimates	10
Lower Snake River Sport Harvest Estimates	11
Columbia River Tribal Zone 6 Harvest Estimates	11
Estimating Composition Proportions And Harvest Contribution	11
Lower Columbia River Sport	11
McNary Pool and lower Snake River Sport	11
Tribal Zone 6 Fall Period.....	12
DISCUSSION.....	13
REFERENCES	15
APPENDIX A	46

LIST OF TABLES

Table 1.	Summer steelhead smolt releases by region and brood year (BY) in the Columbia River basin. Upst BON = releases upstream of Bonneville Dam. MY = smolt migration year.	17
Table 2.	Lower Columbia River sport harvest and samples collected monthly from June 16 to October 31, 2017 and the total harvest from June 16 to October 31 from 2014 to 2016. Although nine fish were reported kept in August 2017, retention of steelhead was not permitted that month.	18
Table 3.	Samples collected in sport fisheries in the main stem Columbia River and the Snake River downstream of the Idaho/Washington border from July 1 to December 31, 2017.	18
Table 4.	Chinook, sockeye, and steelhead harvest in the Tribal Zone 6 fishery during the 2017 summer management period and the number of clipped and unclipped steelhead samples analyzed. The total steelhead harvest for the prior three summer seasons is also shown. Platform and hook and line fishing was open the entire season. There was no set net fishery in statistical week 25 and 32.	19
Table 5.	Chinook, coho, and steelhead harvest in the Tribal Zone 6 fishery during the 2017 fall management period and the number of clipped and unclipped steelhead samples analyzed. The total steelhead harvest for the prior three fall seasons is also shown. Platform and hook and line fishing was open from August 1 to November 30. There was no set net fishing from August 1 to August 20 and October 6 to November 30, 2017.	20
Table 6.	Description of hatchery stocks, release groups, and tag rates for Brood Year (BY) 2013 to 2015 that were included in the PBT parental baseline used to make assignments for steelhead returning to the Columbia River in 2017. Three ocean adults were from BY2013, two ocean adults from BY2015, and one ocean adults from BY2016. ns = not sampled. At Wells Hatchery the Omak and Okanogan release groups were not tracked separately until BY2015.	21
Table 7.	Distinct group assignments made in all sport and tribal fisheries with their stock and basin assignments. We identified 38 distinct PBT release groups and 12 distinct GSI reporting groups. The MGILCS GSI group and the SKAMAN GSI group and Skamania PBT group span more than one basin, hence we used treated them as a distinct basin when discussing results at the basin spatial scale.	22
Table 8.	Re-allocation table used to subtract samples from GSI reporting groups after expanding the hatchery release groups by their PBT tag rate. For each hatchery release group the proportios that assigned to each GSI reporting group is shown. The release groups shaded in grey were combined to calculate one proportion for all of the groups. n = number of assignments used to calculate the proportions.	23
Table 9.	Preliminary TAC steelhead passage estimates at Bonneville Dam and dam counts of clipped and unclipped steelhead at Bonneville Dam, McNary Dam and Ice Harbor dams from July 1 to October 31, 2017.	24
Table 10.	Composition+ and harvest estimates by PBT release group and GSI reporting group in the lower Columbia River sport fishery, June 16 to October 31, 2017. All fish harvested were adipose clipped hatchery origin.	

	GSI assignments were made for fish that did not assign to a PBT release group.	25
Table 11.	Composition and harvest estimates of the PBT assigned hatchery stocks in the lower Columbia River sport fishery, June 16 to October 31, 2017. All harvested fish were adipose clipped hatchery origin.	27
Table 12.	Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the lower Columbia River sport harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 26.9% of all large fish sampled came from the Dwor-C stock and 63.6% of the fish within the Dwor-C stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if > 10 fish were sampled.	28
Table 13.	Composition and harvest estimates of clipped steelhead by PBT release group and GSI reporting group in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017. All fish harvested were adipose clipped hatchery origin. GSI assignments were made for fish that did not assign to a PBT release group.	29
Table 14.	Composition and harvest estimates of the clipped PBT assigned hatchery stocks in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017. All harvested fish were adipose clipped hatchery origin.....	31
Table 15.	Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the Zone 6 tribal clipped harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 68.2% of all large fish sampled came from the Dwor-C stock and 44.1% of the fish within the Dwor-C stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if > 10 fish were sampled.	32
Table 16.	Composition and harvest estimates of unclipped steelhead by PBT release group and GSI reporting group in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017.....	33
Table 17.	Composition and harvest estimates of the unclipped PBT assigned hatchery stocks in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017.	34
Table 18.	Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the Zone 6 tribal unclipped harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 37.5% of all large fish sampled came from the MGILCS stock and 3.5% of the fish within the MGILCS stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if > 10 fish were sampled.	35

LIST OF FIGURES

Figure 1.	Map of the Columbia River where fisheries were sampled to determine steelhead stock composition. Sport anglers were sampled from the mouth upstream to Pasco and tribal fisheries were sampled upstream of Bonneville Dam in Zone 6.	36
Figure 2.	Map of the lower Snake River showing boundaries of the sections used by WDFW to estimate the monthly steelhead harvest. We estimated the steelhead stock composition from samples obtained in Sections 640, 642, 644, 646, and 648.	37
Figure 3.	Map showing the GSI reporting groups that have been developed by CRITFC. These groups were used to assign adipose clipped and adipose unclipped steelhead that were not identified with PBT.	38
Figure 4.	Run-timing of hatchery and wild summer steelhead stocks and fall Chinook at Bonneville Dam in 2017. Skamania stock is for fish released in the Klickitat River. Wild run timing in each region was calculated by combining all wild fish tagged as juveniles that returned as adults in 2017. The wild Snake River stock excludes fish tagged at Snake River dams	39
Figure 5.	Run-timing of hatchery and wild steelhead stocks at McNary Dam in 2017. Wild run timing in each region was calculated by combining all wild fish tagged as juveniles that returned as adults in 2017. The wild Snake River stock excludes fish tagged at Snake River dams.	40
Figure 6.	Hatchery stock composition in the Lower Columbia River sport fishery for the entire season, June 16 to October 31, 2017. Steelhead could not be kept in August.	41
Figure 7.	Harvest contribution by basin in the Lower Columbia River sport fishery, June 16 to October 31, 2017.	41
Figure 8.	Hatchery stock composition of the 19 samples collected in the McNary Pool sport fishery.	42
Figure 9.	Hatchery stock composition of the 21 samples collected in the lower Snake River sport fishery.	42
Figure 10.	Hatchery stock composition of the clipped steelhead caught in the Tribal Zone 6 fall period fishery.	43
Figure 11.	Harvest contribution by basin of clipped steelhead caught in the Tribal Zone 6 fall period fishery. The SKAMAN basin contributed 0.5% of the harvest (not shown in chart).	43
Figure 12.	Hatchery stock composition of the unclipped steelhead that were identified with PBT in the Tribal Zone 6 fall period fishery. PBT assignments were made for 13% of the total unclipped fish.	44
Figure 13.	Stock composition of the unclipped steelhead GSI reporting groups in the Tribal Zone 6 fall period fishery. GSI assignments were made for 87% of the total unclipped fish.	44
Figure 14.	Contribution by basin of all unclipped steelhead caught in the Tribal Zone 6 fall period fishery.	45

ACKNOWLEDGEMENTS

This report was a cooperative effort among the Idaho Department of Fish and Game, Washington Department of Fish and Wildlife, Yakama Nation, Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, and the Pacific States Marine Fish Commission to categorize the stock composition of the summer steelhead harvest in the Columbia River from its mouth to the Highway 395 bridge near Pasco, Washington and the Snake River downstream of the Idaho/Washington border. The authors wish to acknowledge the assistance of staff from all agencies that collected and genotyped the samples obtained from sport and tribal fisheries. The report that follows is a multi-agency product under the technical lead of Alan Byrne.

ABBREVIATIONS AND ACRONYMS

BON	Bonneville Dam
BWSALM	Big White Salmon River GSI reporting group
BY	Brood Year
CI	Confidence Interval
CRITFC	Columbia River Inter-Tribal Fish Commission
CWT	Coded Wire Tag
DPS	Distinct Population Segment
EF	East Fork
GSI	Genetic Stock Identification
IDFG	Idaho Department of Fish and Game
JSR	Joint Staff Report
KLICKR	Klickitat River GSI reporting group
LOWCOL	Lower Columbia River GSI reporting group
lci	Lower 90% Confidence Interval
MCN	McNary Dam
MFSALM	Middle Fork Salmon River GSI reporting group
MY	Migration Year
MGILCS	Mid-Columbia-Grande Ronde-Imnaha-Lower Snake-Lower Clearwater-Lower Salmon GSI reporting group
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
PBT	Parentage Based Tagging
PIT	Passive Integrated Transponder
PSMFC	Pacific States Marine Fish Commission
SBT	Shoshone Bannock Tribe
SFCLWR	South Fork Clearwater River GSI reporting group
SFSALM	South Fork Salmon River GSI reporting group
SKAMAN	Skamania GSI reporting group
TAC	<i>U.S. v Oregon</i> Technical Advisory Committee
uci	Upper 90% Confidence Interval
UPCLWR	Upper Clearwater (Lochsa River and Selway River) GSI reporting group
UPPCOL	Upper Columbia River GSI reporting group
UPSALM	Upper Salmon River GSI reporting group
WILLAM	Willamette River GSI reporting group
WDFW	Washington Department of Fish and Wildlife
YAKIMA	Yakima River GSI reporting group
YN	Yakama Nation

ABSTRACT

We estimated the stock composition of steelhead harvested in the Columbia River sport fisheries downstream Bonneville Dam from June 16, 2016 to October 31, 2017. The stock composition of steelhead in tribal Zone 6 fisheries was estimated from August 1, 2017 to November 30, 2017. The summer steelhead return of 113,350 fish at Bonneville Dam from July 1, 2017 to October 31, 2017 was the lowest return since 1979. The low return of steelhead caused sport fisheries in the Columbia River to be constrained with time and area closures and the daily steelhead harvest limit was reduced to one adipose clipped steelhead. We collected enough samples this year to make estimates of stock composition in the lower Columbia River sport and tribal Zone 6 fall period fisheries. Steelhead from the Snake River basin hatcheries made up 42% of the Columbia River sport harvest downstream of Bonneville Dam, 90% of the adipose clipped Zone 6 tribal fall harvest, and 10% of the adipose unclipped Zone 6 tribal fall harvest. Most of the harvest in the lower Columbia sport and adipose clipped tribal Zone 6 fisheries were 1-ocean steelhead. The number of harvested steelhead in the sport and tribal fisheries this year was the lowest observed since we began monitoring these fisheries for steelhead stock composition in 2011.

INTRODUCTION

This is the seventh year that we have estimated the stock composition in the sport and tribal summer steelhead harvest in the Columbia River. (Byrne et al. 2018a, Byrne et al. 2018b, Byrne et al. 2016, Byrne et al. 2015, Byrne et al. 2014a and Byrne et al. 2014b). Until this study was initiated, there were no estimates of the harvest contribution of hatchery and wild stocks in the tribal and non-tribal fisheries in the Columbia River. The Snake River basin hatchery stocks were expected to contribute a large portion of the sport and adipose clipped tribal harvest since most of the summer steelhead smolt releases in the Columbia River basin were from the Snake River basin (Table 1). The Idaho Department of Fish and Game (IDFG) coordinated the sampling of steelhead harvested in the lower Columbia River sport fishery downstream of Bonneville Dam from June 16 to October 31 and in the tribal Zone 6 fishery from Bonneville Dam to McNary Dam from June 16 until its closure on November 30, 2016 (Figure 1). The primary cooperators in this effort were IDFG, Columbia River Inter-Tribal Fish Commission (CRITFC), Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), and the Pacific States Marine Fish Commission (PSMFC).

The run-timing of summer steelhead into the Columbia River overlaps the run-timing of spring, summer, and fall Chinook, sockeye, and to a lesser extent coho. Spring, summer, and fall Chinook are targeted by non-Indian commercial fisheries downstream of Bonneville Dam, tribal commercial, ceremonial, and platform fisheries upstream of Bonneville Dam, and sport fisheries downstream and upstream of Bonneville Dam. All steelhead caught in non-Indian commercial fisheries must be released. Only steelhead with a clipped adipose fin (hereafter referred to as clipped) may be kept in sport fisheries. Steelhead, both clipped and those with an intact adipose fin (hereafter referred to as unclipped) may be retained in any tribal fishery.

As defined in *U.S. v Oregon*, Chinook fisheries in the Columbia River are managed for three time periods: Upriver spring and Snake River summer Chinook from January 1 to June 15; upper Columbia River summer Chinook from June 16 to July 31; and fall Chinook from August 1 to December 31. Steelhead run sizes, which are used to determine ESA and harvest impacts, are counted at Bonneville Dam during three time periods: winter run from November 1 to March 31, Skamania run from April 1 to June 30, and the Upriver A-Index and B-Index run from July 1 to October 31. A-Index fish are defined as steelhead < 78 cm and B-Index as steelhead \geq 78 cm that pass Bonneville Dam during this time period. Harvest rates (which are converted to allowed catch depending on run size) and ESA impact rates are determined for each management period. Steelhead harvest is estimated for all tribal and non-Indian fisheries. In sport fisheries, steelhead harvest is estimated with creel surveys on a monthly basis in the lower Columbia River downstream of Bonneville Dam. Sport catch upstream of Bonneville Dam is estimated monthly from catch record cards and may not be available for several years. Sport steelhead harvest is reported as the number of fish kept. Preliminary steelhead and Chinook harvest estimates in the tribal Zone 6 fishery are made on a weekly basis beginning June 16. This allows managers to adjust seasons to keep steelhead impacts and harvest of summer and fall Chinook within the limits that are outlined in *U.S. v Oregon*. Final harvest estimates are reported by *U.S. v Oregon* Technical Advisory Committee (TAC) at the conclusion of the tribal fishery. Tribal fall season steelhead harvest estimates are reported as the number of clipped and unclipped fish kept that were <78 cm (A-Index) and \geq 78 cm (B-Index). The tribal summer season steelhead harvest was not always separated into A-Index and B-Index in past years, however estimates for both groups were made in 2017.

The return of 113,350 Upriver A and B Index steelhead was the lowest since a return of 101,077 steelhead in 1979. Additionally, the return of B-Index steelhead was forecasted to be the lowest observed in recent years and the preliminary post season run reconstruction of B-Index

steelhead was lower than the pre-season forecast. The combination of a low total return and a poor B-Index return constrained all fisheries in the Columbia River. The daily limit for sport fishers was reduced to one adipose clipped steelhead and time and area closures were imposed. All fisheries were managed conservatively to remain within the total and B-Index allowable impacts.

The number of fish each hatchery and stock contributes to fisheries downstream of the Idaho border in the Snake and Columbia rivers is necessary to fully evaluate the performance of Idaho's hatchery program. Idaho Department of Fish and Game began sampling hatchery steelhead used for broodstock starting with Brood Year (BY) 2008 at all hatcheries in Idaho. Beginning with BY2009 and continuing each year afterward, all hatchery steelhead used for broodstock in the Snake River basin have been sampled by IDFG, WDFW, and ODFW. CRITFC has worked with other managers beginning with BY2012 to collect samples from steelhead broodstock from non-Snake River hatcheries in the Columbia River. This effort has increased the number of hatchery stocks we can identify with Parental Based Tagging (PBT) methods.

All adipose clipped fish are known to be hatchery origin. Clipped hatchery fish from the Snake River and other hatcheries could be assigned to a hatchery stock and release group using PBT markers. Clipped steelhead that did not assign using PBT markers were a hatchery fish from an adult whose parents were not genotyped. These PBT unassigned hatchery origin fish were then assigned using Genetic Stock Identification (GSI) markers. Steelhead with an intact adipose fin could be a wild fish or hatchery origin fish released without a clipped adipose fin. Samples from unclipped steelhead were analyzed using PBT markers to determine if the fish was hatchery origin. Unclipped samples that did not assign to a PBT hatchery release group (putative wild fish) were assigned to a Columbia River GSI reporting group developed by CRITFC (Hess et al. 2013). The GSI reporting groups outside of the Snake River basin contain wild and hatchery origin steelhead. GSI reporting groups within the Snake River basin (excluding the MGILCS group) were developed using wild fish only.

All dates used in this report are in calendar year 2017 unless noted otherwise.

METHODS

Steelhead Passage at Bonneville, McNary and Ice Harbor Dams

The daily count of clipped and unclipped steelhead at Bonneville Dam, McNary Dam, and Ice Harbor Dam from July 1 to October 31 was obtained from the Army Corp of Engineers (available at <http://www.fpc.org/environment/home.asp>). CRITFC personnel sampled steelhead at Bonneville Dam and recorded the fork length and the presence or absence of the adipose fin. Steelhead were designated as hatchery or wild origin primarily based on the presence of a fin clip or an eroded dorsal fin. If either was observed, the default designation was hatchery and if both were absent, the default designation was wild origin. However, when aging scales a small proportion of unclipped fish initially categorized as wild were changed to hatchery origin if rapid freshwater scale growth was observed with the absence of any hard freshwater annuli checks (Jeff Fryer, CRITFC, personal communication). Beginning in 2011, CRITFC obtained tissue samples from all steelhead that were handled and used PBT to determine if any unclipped fish were hatchery origin. If an unclipped fish that was visually called wild was determined to be hatchery origin using genetic analysis, we used classified that fish as unclipped hatchery origin. TAC used this data to estimate the percentage of A-Index and B-Index hatchery fish of clipped steelhead and the percentage of A-Index and B-Index wild and hatchery fish using the unclipped samples. These percentages were estimated within seven time strata. The clipped percentages were multiplied by the clipped steelhead dam count and the unclipped percentages were multiplied by the unclipped steelhead dam count in each strata to estimate the number of wild and

clipped and unclipped hatchery origin A-Index and B-Index fish that passed the dam. The total A-Index and B-Index wild and clipped and unclipped hatchery passage at Bonneville Dam was the sum of all time periods.

Steelhead Run-Timing at Bonneville and McNary dams

All hatchery steelhead stocks in the Snake River basin and several stocks in the upper Columbia River are representatively PIT tagged prior to release as smolts. Wild juvenile steelhead are also PIT tagged throughout the basin. We obtained the daily number of adult summer steelhead detections of each stock at Bonneville and McNary dams from April 1, 2017 to April 30, 2018 (detection data obtained from <http://www.ptaqis.org>). We only used the adult detection data of hatchery and wild summer steelhead that were tagged as juveniles, that migrated to the ocean in the spring of 2016 or earlier, and were returning to spawn in the spring of 2018 (adults spawning in the spring of 2017 would not be available to the fisheries we sampled). Some of the adults that were detected were determined to be kelts based on their detection history at main stem dams and tributary PIT arrays and were removed from the analysis. The run-timing of each Snake River hatchery stock, except the Dworshak stock, was calculated by combining detections from all of the stock's release groups and BYs. The Dworshak stock was split into two groups: fish reared at Dworshak or Clearwater hatcheries and released in the Clearwater drainage (Dwor-C) and those fish reared in the Hagerman Valley hatcheries and released in the Salmon drainage (Dwor-S). The parents of both Dwor-C and Dwor-S groups were trapped and spawned at Dworshak Hatchery. The Skamania stock run-timing was calculated using only fish that were released in the Klickitat River. The upper Columbia hatchery run-timing was calculated by combining detections of all hatchery stocks and BYs upstream of the Yakima River. The run-timing of wild steelhead from the middle Columbia (Bonneville Dam to Yakima River, excluding the Snake River basin), upper Columbia (all rivers upstream of the Yakima River), and Snake (all rivers in the Snake River basin upstream of Lower Granite Dam) regions was calculated by combining detections from all release sites in each region. We estimated the cumulative passage proportion for each date of all wild and hatchery stocks at Bonneville Dam.

We did not calculate the middle Columbia (Mid-C) wild run-timing at McNary Dam since most of these fish were tagged and released downstream of McNary Dam. The McNary Dam run-timing for the wild and hatchery stocks from the upper Columbia (Up-C) and Snake River basin was calculated using all detections at McNary Dam from those stocks (some adults may not have been detected at Bonneville Dam).

Lower Columbia River Sport Harvest Estimates

Sport anglers could retain one hatchery steelhead per day in the Columbia River from Buoy 10 to Bonneville Dam from June 16 to July 31 and September 1 to December 31. The retention of steelhead was not permitted downstream of Bonneville Dam during the month of August and night fishing closures (except for registered anglers fishing for pikeminnow) were imposed in the main stem Columbia River. Sport fisheries, in the Columbia River from Buoy 10 upstream to the Highway 395 bridge near Pasco, Washington, were allowed a 2% impact rate on wild A-run and 2% on wild B-run steelhead in July and an additional 2% impact on A-run and B-run fish from August 1 to December 31. There was no catch quota on the harvest of clipped steelhead. The recreational sport fishery downstream of Bonneville Dam is divided into ten sampling sections (Figure 1). Personnel from ODFW and WDFW conduct random angler interviews at their respective boat ramps, beaches, and on the river to determine catch rates for each species in each section. The total number of fish caught and released for each species, month, and section is estimated by combining total angler effort estimates derived from aerial

surveys and bank angler counts with the observed angler catch rates in each section (Watts 2013 and TAC 2008). No attempt was made to parse the harvest to hatchery stocks.

Columbia River Upstream of Bonneville Dam Sport Harvest Estimates

Sport anglers could retain one clipped hatchery steelhead per day in the main stem Columbia River between Bonneville Dam and McNary Dam from June 16 to December 31 in the sections of the river that were open to harvest. Night fishing closures (except for registered anglers fishing for pikeminnow) were imposed in the main stem Columbia River. Retention of steelhead was not permitted in the main stem Columbia River in these sections and time periods: Bonneville Dam to The Dalles Dam in August; The Dalles Dam to John Day Dam in September; John Day Dam to McNary Dam in September and October and; McNary Dam to the Highway 395 bridge near Pasco in October and November. Wild B steelhead impacts from tributary fisheries between Bonneville Dam and McNary Dam are included in the allowed 2% wild B impacts for main stem Columbia River sport fisheries. Steelhead harvest in the Columbia River and tributaries upstream of Bonneville Dam are estimated using catch record cards. The final monthly harvest estimates are posted on the WDFW website (available at: <http://wdfw.wa.gov/fishing/harvest>) and the ODFW website (available at: <http://www.dfw.state.or.us/resources/fishing/sportcatch.asp>) when the catch estimates are finalized. The wild impacts from sport fishing upstream of Bonneville Dam are modeled in-season using the estimated stock proportions and abundance at Bonneville Dam.

Lower Snake River Sport Harvest Estimates

Catch and release only fishing for steelhead was permitted from September 1 to November 17. From November 18 to March 31, 2018 anglers could retain two adipose clipped steelhead per day. The recreational sport fishery downstream of the Washington/Idaho border is divided into five sampling sections (Figure 2). The harvest estimates in these sections were based on catch record card data. The final monthly harvest estimates in each section, when available, are posted on the WDFW website (<http://wdfw.wa.gov/fishing/harvest/>).

Columbia River Tribal Zone 6 Harvest Estimates

There were six time periods open for commercial set net fishing during the summer management period from June 19 to July 28 that primarily targeted summer Chinook and sockeye salmon. There were no steelhead harvest limits during the summer season, however steelhead harvest was estimated using the same methods that were used in the fall management period. In the fall management period, which began on August 1, there were seven time periods open for commercial set net fishing from August 21 to October 5 that primarily targeted fall Chinook salmon. In addition to the commercial set net seasons, platform and hook and line fisheries were open daily from June 16 through November 30. Fisheries during the fall management period catch significant numbers of steelhead as both species are abundant in Zone 6 during the time period the commercial seasons are open.

The harvest rate for treaty fisheries for the fall management season (August 1 to October 31) is based on a sliding scale of the abundance of upriver fall Chinook and total B-run steelhead counted at Bonneville Dam as outlined in *U.S. v. Oregon*. There is no specific harvest rate limit on A-run steelhead. In 2017, the allowable harvest rate of total B-Index steelhead in the treaty fall period fishery was 13%.

Tribal monitors from the YN sample catch at landing points (often at in-lieu fishing sites). Data are collected on number of fish per net, number of nets sampled, numbers of times per day nets are checked, and number of nets each sampled crew were fishing. Steelhead are measured

and classified as A-Index (<78 cm) or B-Index (\geq 78 cm) fish and presence or absence of an adipose fin-clip is noted.

WDFW crews sample the tribal catch for biological data at commercial buying stations (ticketed catch). Fork length and presence or absence of the adipose fin was recorded. In cases where the non-ticket catch is a large proportion of the total catch, the YN uses information from the WDFW sampled ticketed catch combined with the YN sampling data to estimate the number of steelhead that were harvested. All tribal steelhead harvest estimates were reviewed and then reported by TAC. In-season steelhead harvest estimates were made weekly for clipped and unclipped A-Index and B-Index fish (Yakama Nation and TAC, unpublished data). Final harvest estimates for the summer and fall management periods were made post-season (JSR 2018).

Sample Collection in the Lower Columbia River Sport Fishery

Sport anglers were sampled by the WDFW creel survey crews that were used to estimate harvest from Buoy 10 upstream to Bonneville Dam. All steelhead that were encountered had a small piece of tissue removed for the genetic analysis. In addition to a tissue sample, crews also checked the fish for a Coded Wire Tag (CWT), PIT tag, measured the fork length, and recorded the river section and date the fish was caught. The first samples were obtained on June 16 and the last sample was collected on October 13. Retention of steelhead was not permitted in August, hence no samples were collected that month. A total of 238 valid samples were genotyped for analysis of the sport fishery. We estimated the stock composition and harvest contribution for the entire period from June 16 to October 31 using all valid samples (Table 2).

Sample Collection in the Columbia River Upstream of Bonneville Dam Sport Fisheries

WDFW crews sampled anglers upstream of Bonneville Dam in sections of the main stem Columbia River that was open to steelhead retention. In addition to a tissue sample, crews measured the fork length and recorded the location and date the fish was caught. Due to the low steelhead return and time and area closures imposed on sport anglers only 42 samples were collected upstream of Bonneville Dam. (Table 3). We only report the stock composition of the samples we collected in the McNary Pool, however due to the small sample size ($n = 19$) results should be viewed with caution.

Sample Collection in the Lower Snake River Sport Fishery

WDFW creel crews sampled fish caught by sport anglers in the Snake River downstream of the Idaho/Washington border once the retention of steelhead was permitted on November 18.. All steelhead that were encountered had a small piece of tissue removed for the genetic analysis. In addition to a tissue sample, crews also checked the fish for a CWT, PIT tag, measured the fork length, and recorded the river section and date the fish was caught. A total of 21 samples were collected and all samples were obtained in December (Table 3). No samples were collected from January 1, 2018 to March 31, 2018. We report the stock composition of the 21 samples we collected, however due to the small sample size results should be viewed with caution..

Sample Collection in the Columbia River Zone 6 Tribal Fishery

Tribal Zone 6 harvest in the main stem Columbia River was sampled by Yakama Nation crews in the Bonneville Pool, The Dalles Pool, John Day Pool, and at commercial buyers. The commercial samples were obtained by randomly choosing totes of steelhead and sampling all fish in the tote. In addition to a tissue sample, crews also checked the fish for a PIT tag, measured the fork length, recorded whether the fish had a clipped adipose fin, and the river section and date

the fish was caught. The first samples were obtained on June 21 and the last sample collected on October 5. A total of 359 samples from clipped steelhead and 165 samples from unclipped steelhead were used in the analysis.

We did not estimate the stock composition or harvest contribution of the clipped and unclipped steelhead caught in the summer period due to low sample size. Only 12 clipped and 22 unclipped samples were obtained from June 16 to July 31 (Table 4).

The stock composition and harvest contribution was estimated separately for clipped and unclipped steelhead harvested in the fall management period that began on August 1. We used all the valid samples we collected on and after August 1. We used 347 clipped samples and 143 unclipped samples to make stock composition and harvest contribution estimates in the fall period (Table 5).

Estimating Composition Proportions And Harvest Contribution of Steelhead

Clipped steelhead are known to be hatchery origin whereas unclipped steelhead could be an unclipped hatchery fish or wild fish. In all sport fisheries only clipped steelhead could be kept. In the tribal fisheries both clipped and unclipped steelhead could be retained. All fish were genotyped at 269 SNPs for an assignment to a GSI reporting group, a possible assignment to a hatchery release group and BY using PBT, and a sex-specific genetic assay for determining the sex of the fish. The genotyping was done at the IDFG genetics lab. Genetic stock identification is detailed in Ackerman et al. (2016) along with the methods for extraction of genomic DNA from tissue samples, DNA amplification, and SNP genotyping. Steele et al. (2016) contains similar details for PBT analysis. If a fish was identified with PBT, we assigned the fish to its release group and BY (Table 6). Fish that were unassigned with PBT were either a hatchery-origin fish whose parents were not in the PBT baseline or a wild-origin fish. All PBT unassigned fish (clipped and unclipped) were assigned to the most probable reporting group in a GSI baseline that was developed by CRITFC and is described in Hess et al. 2013 (Figure 3). All adipose-clipped fish assigned to a GSI group were hatchery origin. We identified 19 distinct hatchery release groups from four BYs for a total of 38 distinct PBT hatchery release groups and 12 distinct GSI reporting groups in the samples we analyzed. Hatchery release groups were assigned to a hatchery stock. All PBT release groups and GSI reporting groups were assigned to a river basin (Table 7). The MGILCS GSI group span more than one basin, hence we treated this group as a distinct basin. The SKAMAN GSI group and Skamania PBT release group span more than one basin and both are closely related to each other, hence treated these groups as a distinct basin.

Analysis was done for each fishery. In the tribal fisheries we analyzed the clipped fish and unclipped fish separately. The actual count in each PBT release group was divided by its tagging rate (Table 8) to get an expanded count. The expanded count can be thought of as the expected number of fish from each release group that would have been sampled if all release groups had a tag rate of 1. Since fish were added to hatchery release groups after expanding for their tag rate, an equal number of fish must be subtracted from the GSI reporting groups.

The difference (D) between the expanded count (E) and actual count (U) of hatchery release group i and Brood Year b was:

$$D_{ib} = E_{ib} - U_{ib}$$

The difference between the expanded and actual count for each reporting group i was the sum of differences for all BYs that were present:

$$D_i = D_{i1} + D_{i2} + D_{i3} + D_{i4}$$

where

1, 2, 3, and 4 are Brood Year 2013, 2014, 2015, and 2016.

The number of samples to subtract from GSI reporting group k in was:

$$n_k = \sum_{i=1}^{19} p_{ik} * D_i$$

Where:

n_k = the reallocation amount for GSI reporting group k after accounting for the PBT expanded counts.

p_{ik} = proportion of hatchery release group i that assign to GSI reporting group k (see Table 8). Each p_{ik} represents the percentage of hatchery release group i that would assign to GSI reporting group k if PBT was not used. These proportions were calculated using all PBT assignments from all BYs and their associated GSI assignment from all fisheries sampled from 2011 to 2017. Release groups that were combined to calculate a single value for all of the groups were (a) Dwor-C and Dwor-S; (b) Sawtooth, SBT_Yankee; SBT_Indian; (c) Upper Salmon and USAL_Yankee; and (d) Okanagan, Omak, Twisp, Wells, and Winthrop.

If the sum of all D_i was greater than or equal to the sum of all U_k , (the number of samples assigned to all GSI groups) then all GSI reporting groups were set to zero (and their proportion of the harvest was set to zero). The proportion (R) of the harvest from each PBT release group was:

$$R_{ib} = E_{ib} / \sum_{i=1}^{19} \sum_{b=1}^4 E_{ib}$$

If the sum of all D_i was less than the sum of all U_k , then the adjusted count of each GSI reporting group (A_k) was found by subtracting the reallocation amount (n_k) from the actual count (U_k) in each GSI group:

$$A_k = U_k - n_k, \text{ for } n_k < U_k$$

The PBT release group proportions were found by dividing their expanded count by the sample size. The GSI reporting group proportions were found by dividing their adjusted count by the sample size.

To estimate the harvest contribution of each release and reporting group, we multiplied the harvest estimate by the groups proportion as found above. Harvest estimates were calculated for the lower Columbia River sport fishery and the tribal fall period Zone 6 fishery. The proportion of each hatchery stock's composition and harvest contribution was found by adding all of the stocks release group BYs proportions and harvest estimates. We also present results at the river basin spatial scale for stock composition proportions and harvest contribution. Basin level proportions and harvest contribution was found by summing all PBT and GSI group proportions and harvest estimates within each river basin.

Due to the small number of samples collected this year, we only report the stock composition proportions in the McNary Pool and lower Snake River sport fisheries.

Confidence Intervals For Group, Stock, and Basin Proportions

Confidence intervals for the PBT release group and GSI reporting group composition estimates were generated using the script *Bootstock 3.1.r* performed in the R programming environment (R Development Core Team 2009). *Bootstock 3.1.r* resamples with replacement from an original sample or set of data. For each iteration, the original group assignments were resampled with replacement s number of times where $s =$ the number of samples. Within each iteration, we then calculated the expanded Hatchery release group/Brood year and adjusted GSI reporting group proportions and harvest contribution as outlined in the previous section. We performed 10,000 iterations for the lower Columbia River sport and the tribal Zone 6 fall period clipped and unclipped fisheries. Values of the 10,000 iterations were sorted in ascending order. The $100(1-\alpha)\%$ confidence intervals for the group proportions were the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ values of the ordered bootstrap values. The CIs for the total proportion of each PBT stock were found by summing all reporting group and BY proportions of the stock in each bootstrap iteration and choosing the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ ordered values. The CIs at the basin spatial scale was found by summing all groups within each basin in each iteration and choosing the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ ordered values.. We report 90% CIs for all fisheries. *Bootstock 3.1.r* was used to analyze the 2015 and 2016 Columbia River harvest data and the code can be found in those reports (Byrne, et al. 2018a and Byrne, et al. 2018b)..

Sex, Fish Length and Ocean Age Percentages

For the hatchery stocks we combined all release groups and BYs when calculating the sex ratios and percent of large fish (≥ 78 cm fork length) in each fishery Sex ratios were calculated for hatchery stocks and GSI reporting groups using the results of a genetic sex marker that was run on each sample during genotyping (Campbell et al. 2012). The percent of fish ≥ 78 cm fork length were calculated for hatchery stocks and GSI reporting groups using the samples that were measured for length. We report the percentage of all large fish that were sampled in each fishery from each hatchery stock and GSI group and the percentage of large fish within each hatchery stock and GSI group. For the GSI reporting groups, we used the actual count using the best GSI assignment for those fish that were not identified with PBT. In all sport fisheries these GSI groups are hatchery origin fish that did not assign to a PBT release group. In the tribal unclipped GSI groups these fish are putative wild steelhead, although some unassigned unclipped hatchery origin fish may be present. Percentages for sex ratios and percent large within each PBT stock and GSI group were calculated if we had at least 10 samples from the stock or GSI group. Ocean age percentages were calculated for hatchery stocks (for $n \geq 10$) identified with PBT only.

RESULTS

Steelhead Passage at Bonneville, McNary and Ice Harbor Dams

Steelhead passage totals was from July 1 to October 31 at all dams. Steelhead passage at Bonneville Dam was 113,350 total fish, 80,709 clipped fish, and 32,641 unclipped fish. The preliminary TAC estimate of wild fish was 28,660 (27,909 A-Index, and 751 B-Index). The Bonneville Dam preliminary return estimates of A-Index wild, B-Index hatchery, and B-Index wild fish were less than the pre-season forecast. The McNary Dam passage was 56,464 clipped fish and 21,804 unclipped fish for a total passage of 78,263. The Ice Harbor Dam passage was 48,273 clipped fish and 12,545 unclipped fish for a total passage of 60,818 (Table 9).

Steelhead Run-Timing at Bonneville and McNary dams

The Skamania stock released in the Klickitat River was the earliest arriving stock at Bonneville Dam. The 50% arrival date for Skamania stock was on June 20 and was reached nearly two months before the next hatchery stock reached its 50% date. The 90% arrival date for the Skamania stock was July 25 and was attained before any other wild or hatchery stock reached its 50% arrival date. The Mid-C wild stock was the second earliest to arrive and it attained its 50% and 90% date on August 3 and September 13, respectively. The earliest Snake basin hatchery stock was the Imnaha and Tucannon. Both of these stocks attained the 50% date on August 19. All other Snake River basin hatchery, Mid-C hatchery, and Up-C hatchery stocks attained their 50% arrival date between August 20 and September 2 except for the Dworshak stock released in the Salmon drainage (Dwor-S) and Clearwater drainage (Dwor-C), the SF Clearwater, and Upper Salmon stocks. The latest stocks to attain their 50% date were the Upper Salmon (October 1), Dwor-S (September 29), SF Clearwater (September 23), and Dwor-C (September 18). Wild fish from the Up-C and Snake both attained their 50% date on August 17. The 50% arrival date for the Snake River hatchery stocks spanned 43 days and ranged from August 19 to October 1 (Figure 4 and Appendix A).

The Bonneville Dam passage of Dwor-C and Dwor-S groups when the first fall season commercial tribal net fishery opened on August 21 was 3.8% and 0% complete, respectively. The Bonneville Dam passage of the Wallowa, Imnaha, Oxbow, Pahsimeroi, Sawtooth, Up-C hatchery, and Mid-C hatchery stocks on August 21 ranged from 21.1% to 62.2% complete. The run-timing of fall Chinook salmon at Bonneville Dam was most similar to the Dwor-C and SF Clearwater, however the fall Chinook run timing was about one week earlier than the Dwor-C and 11 days earlier than the SF Clearwater stocks (Figure 4 and Appendix A). The Snake River wild stock passage on the first tribal commercial set net fishing date on August 21 was 58.7% compared to 66.7% for the Up-C and 75.9% for the Mid-C wild stocks.

The earliest arriving stocks at McNary Dam were the Up-C wild and Up-C hatchery stocks which attained their 50% date on September 17 and September 11, respectively. Snake River hatchery stocks, except the Dwor-C, Dwor-S, SF Clearwater, and Upper Salmon attained their 50% arrival date between September 19 and September 27. The latest arriving stock was the Upper Salmon which attained its 50% date on October 10. The 50% arrival date for the Snake River hatchery stocks spanned 21 days and ranged from September 19 to October 10. The Snake River wild stock attained its 50% date on September 23. When the tribal Zone 6 fall period set fishery opened on August 21, the Up-C hatchery and Up-C wild passage was 11.3% and 14.3% complete at McNary Dam. All other hatchery and wild stock passage at McNary Dam was less than 10% complete on August 21 (Figure 5 and Appendix A).

Lower Columbia River Sport Harvest Estimates

In the lower Columbia River sport anglers kept 1,676 steelhead from June 16 to October 31 (Jimmy Watts, ODFW, personnel communication). Over seventy percent of the harvest occurred in July and about 14% in September and October (Table 2).

Lower Snake River Sport Harvest Estimates

The preliminary harvest estimates for were 817 fish kept from November 1 to December 31 and 573 fish kept from January 1, 2018 to March 31, 2018.

Columbia River Tribal Zone 6 Harvest Estimates

Tribal fishers harvested 740 clipped steelhead, 196 unclipped steelhead, 16,935 adult Chinook salmon, and 4,480 sockeye salmon during the summer management period from June 16 to July 31. (Table 6, Roger Dick II, YN, personnel communication). Tribal fishers harvested 6,558 clipped steelhead, 1,881 unclipped steelhead, and 121,674 adult Chinook salmon during the fall management period that began on August 1 (Roger Dick II, YN, personnel communication). About 63% of the total fall period steelhead harvest occurred during a three week period in statistical weeks 38 to 40 (Table 5).

Estimating Composition Proportions And Harvest Contribution

Lower Columbia River Sport

Sport anglers caught 1,676 clipped steelhead from July 1 to October 31 (Table 2). We assigned 67% (CI, 61.5% to 72.5%) of the harvest to PBT release groups. Snake River hatchery groups made up 42.4% (CI, 36.9% to 48.1%) of the harvest. Thirty three percent (CI, 27.5% to 38.5%) of the harvest was PBT unassigned and 26.3% (CI, 21.2% to 30.9%) assigned to the SKAMAN GSI group. The Mid-C hatchery groups made up 5.5% (CI, 3.0 % to 8.1%), the Up-C hatchery groups made up 4.75(CI, 2.5% to 7.2%), and the Skamania PBTassigned groups made up 14.3% (CI, 10.5% to 18.1%) of the harvest. The PBT assigned hatchery stocks that provided the most harvest were the Skamania (14.3%), Wallowa (12.9%), Pahsimeroi (7.2%), and Imnaha (6.1%). The SKAMAN GSI group was the largest contributor to the harvest (26.3%, CI, 21.2% to 30.9%) . The percent of harvest and harvest estimates with confidence intervals for all PBT release groups, GSI reporting groups, and stocks are shown in Tables 10 and 11 and Figure 6.

For the full season, the Snake and SKAMAN basins provided about 42% and 41% of the harvest, respectively. All other basin contributed six percent or less to the harvest (Figure 7).

We identified the sex and obtained the length of 218 and 238 fish, respectively. We estimated that females made up 55.3% of the total harvest. Large fish made up 10.9% of the total harvest. Fifty percent of the large fish were from the SKAMAN stock and 26.9% from the Dwor-C group. The percent of large fish within each release group ranged from 63.6% in the Dwor-C group to 0% in most other PBT assigned hatchery stocks. The percentage of large fish within the SKAMAN group was about 20% (Table 12).

One-ocean adults made up nearly 60%, 2-ocean adults made up 34%, and 3-ocean 6% of PBT assigned stock return. The percent 1-ocean ranged from 100% in the Sawtooth stock to 2.9% in the Skamania stock. We did not sample any 3-ocean fish from the Mid-C or Up-C PBT assigned stocks.

McNary Pool and lower Snake River Sport

In the McNary Pool sport fishery all samples were assigned to PBT release groups. The Dwor-C stock made up 31%, Pahsimeroi stock 27%, and Wallowa stock 21% of the samples we

obtained. The remaining 21% were from the Deschutes, Oxbow, and Tucannon stocks (Figure 8).

In the lower Snake River sport fishery all samples were assigned to PBT release groups. The Wallowa stock made up 53%, Pahsimeroi stock 14%, and Dwor-C stock 10% of the samples we obtained. The remaining 13% were from the Imnaha, Oxbow, Sawtooth, and Upper Salmon stocks (Figure 9).

Tribal Zone 6 Fall Period

Tribal fishers caught 6,558 clipped steelhead during the fall management period (Table 5). We assigned 95.9% (CI, 93.0% to 98.7%) of the harvest to PBT release groups. Snake River hatchery stocks made up 89.8% (CI, 86.3% to 93.2%) of the clipped harvest. About 4% (CI, 1.3% to 7.0%) of the harvest was PBT unassigned, 3.8% (CI, 2.1 % to 5.5%) from Up-C stocks, 2.0% (CI, 0.9% to 3.2%) from Mid-C stocks, and 0.3% (CI, 0% to 0.9%) from the Skamania stock. The Snake River hatchery stocks that provided the most harvest were the Wallowa (27.7%) , Pahsimeroi (22.7%), Oxbow (11.4%), and Dwor-C (10.2%). All other PBT assigned hatchery stocks each made up less than 5% of the harvest (Figure 10). The MGILCS GSI release group had the highest percentage (2.8%) of the unassigned clipped fish. The percent of harvest and harvest estimates with confidence intervals for all PBT release groups, GSI reporting groups, and hatchery stocks are shown in Tables 13 and 14. When all PBT and GSI groups were summed by basin, the Snake basin provided about 90% of the harvest and all other basins contributed less than 5% each (Figure 11).

We identified the sex of 311 and obtained the length from 344 clipped fish. We estimated that 6.4% of the clipped harvest were fish ≥ 78 cm and that 43.3% were females. Nearly 91% of the large fish were from the Snake basin PBT assigned hatchery stocks. The Dwor-C stock provided 68.2%, Wallowa 13.6%, and Pahsimeroi 9.1% of the large fish. All other stocks each made up less than 5% of the total large fish. Forty four percent Dwor-C stock were large. The percent female ranged from 35.1% in the Oxbow stock up to 52.9% in the Dwor-C stock (Table 15). One-ocean adults made up 78.3%, 2-ocean adults made up 19.8%, and three ocean 1.9% of PBT assigned stock return. The percent 1-ocean ranged from 93.3% in the Imnaha stock to 20.6% in the Dwor-C stock. We did not sample any 3-ocean fish from the Mid-C or Up-C PBT assigned stocks.

Tribal fishers caught 1,881 unclipped steelhead during the fall management period (Table 6). We estimated that 13% of the harvest (245 fish) were from unclipped hatchery stocks and 87% (1,636 fish) from putative wild stocks (Tables 16 and 17). Nearly 10% of the total harvest (178 fish) were from unclipped Snake basin hatchery stocks, however no stock was more than 3% of the total unclipped harvest (Figure 12). The MGILCS group had the largest contribution to the total harvest (61.3%, CI 54.3% to 68.1%). All other GSI reporting groups each made up less than 7% of the total harvest (Figure 13). The Snake basin GSI groups made up nearly 14% (261 fish) of the total unclipped harvest. When all PBT and GSI groups were summed by basin, the MGILCS basin made up about 61%, Snake basin 23%, and the Mid-C basin 9% of the unclipped harvest (Figure 14).

We identified the sex of 130 and obtained the length from 140 unclipped fish. We estimated that 5.7% of the unclipped harvest were fish ≥ 78 cm and that 58% were females. We estimate that 37.5% of the large fish were unclipped hatchery origin (25% from the Snake basin and 12.5% from the Up-C basin). The MGILCS group provided 37.5% of the total large fish, however only 3.5% of all MGILCS assigned fish were large (Table 18).

DISCUSSION

The majority of summer steelhead smolts released in the Columbia River basin are produced in the Snake River basin. Snake River basin hatcheries released about 66% of the total BY2015 (1-ocean adult returns) summer steelhead smolts released in the Columbia River basin and 73% of the BY2015 smolts released upstream of Bonneville Dam. The Snake River basin hatcheries released about 73% and of the total BY2014 (2-ocean adult returns) summer steelhead smolts released in the Columbia River basin and 86% of the BY2014 smolts released upstream of Bonneville Dam. We estimated that steelhead from Snake River basin hatcheries made up about 42% of the sport harvest in the lower Columbia River, 90% of the tribal Zone 6 fall period clipped harvest, and 23% of the tribal Zone 6 fall period unclipped harvest. We were able to assign nearly 14% of the tribal Zone 6 fall period unclipped harvest to GSI reporting groups within Idaho. However the actual harvest from Idaho origin GSI fish in the unclipped fall harvest is likely higher since the MGILCS group contributed 61.3% of the harvest and rivers within Idaho are included in this group. We assigned sport and tribal harvest to three Mid-C hatchery release groups from two BYs, 11 Snake River hatchery release groups from 4 BYs, and four Up-C hatchery release groups from three BYs, and 12 GSI reporting groups for a total of 38 distinct groups.

Clipped steelhead that were assigned to a GSI group are known hatchery origin (because of the clipped adipose fin), whereas unclipped GSI assigned fish are considered to be putative wild fish. The GSI groups within the Snake River basin were developed using only wild origin fish, however the non-Snake GSI groups were developed using both hatchery and wild origin fish. Nearly all broodstock in the Snake River basin is genotyped and in the PBT database therefore any unclipped fish that were assigned to a Snake River GSI reporting group were likely wild origin. We do not have broodstock from all hatchery programs outside of the Snake basin genotyped and in the PBT database, hence many non-Snake basin hatchery origin adults caught during the period of this report cannot be assigned to a PBT release group. Unclipped steelhead that assigned to non-Snake River GSI reporting groups could be a wild or an unclipped hatchery origin fish.

The SKAMAN GSI group is very closely related to the Skamania Hatchery stock summer steelhead. Over 99% of known Skamania Hatchery steelhead would have been assigned to the SKAMAN GSI reporting group if their PBT assignment was not used (Table 8). Most of the summer steelhead hatchery programs in the Lower Columbia (Cowlitz and Lewis) and those in the Willamette River basin derived their broodstock from the Skamania summer run stock. We expect that adults sampled from these hatchery programs that are not in the PBT baseline would assign to the SKAMAN GSI reporting group.

We did not obtain many samples during the summer management period from the tribal Zone 6 fishery or from sport fisheries in Drano Lake, McNary Pool, and the Snake River downstream of the Idaho/Washington border. Although we obtained enough samples for estimating the harvest contribution in the tribal Zone 6 fall period and lower Columbia River sport fisheries, the number of samples collected was the lowest since this study began. The summer steelhead return to the Columbia River in 2017 was the lowest since 1979. This caused managers to reduce the daily limit of steelhead to one adipose clipped hatchery fish in the main stem Columbia River and to impose time and area closures. The Snake River did not open for retention of steelhead until mid-November. Additionally, stocks that in the past contributed to the June and July catch in the lower Columbia sport and the summer period tribal fisheries arrived much later than in past years. For example, Pahsimeroi and Wallowa stocks were nearly two weeks later in 2017 than their average run timing the previous five years (Appendix A). The combination of a low and late return of steelhead was reflected in the reduced catch in both sport and tribal

fisheries. The catch in 2017 in all fisheries we sample from the mouth of the Columbia River to the Idaho/Washington border was lowest since we began monitoring these fisheries in 2011.

REFERENCES

- Ackerman, M. W., N. Vu, and M. R. Campbell. 2016. Chinook and steelhead genotyping for genetic stock identification at Lower Granite Dam, 2015 annual report. BPA project 2010-026-00. Idaho Department of Fish and Game report 16-03. Boise
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , J.E. Hess, M.W. Ackerman. 2014a. A genetic analysis of the summer steelhead stock composition in the 2011 Columbia River tribal and sport fisheries. Idaho Department of Fish and Game Report 14-11. Boise.
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , J.E. Hess, M. Begay, J.D. Bumgarner. 2014b. A genetic analysis of the summer steelhead stock composition in the Columbia River and Snake River tribal and sport fisheries from July 1, 2012 to March 31, 2013. Idaho Department of Fish and Game Report 14-12. Boise.
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , J.E. Hess, M. Begay, T. Miller. 2015. A genetic analysis of the summer steelhead stock composition in the Columbia River and Snake River tribal and sport fisheries from July 1, 2013 to March 31, 2014. Idaho Department of Fish and Game Report 15-06. Boise.
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , J.E. Hess, M. Begay, T. Miller. 2016. A genetic analysis of the summer steelhead stock composition in the Columbia River and Snake River tribal and sport fisheries from June 16, 2014 to March 31, 2015. Idaho Department of Fish and Game Report 16-104. Boise.
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , M. Begay, T. Miller. 2018a. A genetic analysis of the summer steelhead stock composition in the Columbia River and Snake River tribal and sport fisheries from June 16, 2015 to March 31, 2016. Idaho Department of Fish and Game 18-106.
- Byrne, A, J. Hymer, S. Ellis, R. Dick II, K. Keller, C.A. Steele , M. Begay, T. Miller. 2018b. A genetic analysis of the summer steelhead stock composition in the Columbia River and Snake River tribal and sport fisheries from June 16, 2016 to March 31, 2017. Idaho Department of Fish and Game 18-107. Boise.
- Campbell, M.R., C.C. Kozfkay, T. Copeland, W.C. Schrader, M.W. Ackerman, and S.R. Narum. 2012. Estimating Abundance and Life History Characteristics of Threatened Wild Snake River Steelhead Stocks by Using Genetic Stock Identification. Transactions of the American Fisheries Society 141(5):1310–1327.
- Hess, J.E., N.R. Campbell, A.P. Matala, and S.R. Narum. 2013. 2012 Annual Report: Genetic Assessment of Columbia River Stocks. U.S. Department of Energy Bonneville Power Administration Report Project #2008-907-00.
- JSR. 2017 Joint Staff Report: Stock Status and Fisheries for Fall Chinook salmon, Coho salmon, Chum salmon, Summer steelhead, and white sturgeon. Joint Columbia River Management Staff. September 7, 2017.
- JSR. 2018 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other species. Joint Columbia River Management Staff. February 20, 2018.
- R Development Core Team. 2009. The comprehensive R archive network. Available: <http://cran.r-project.org/> (February 2013).

- Steele, C., J. McCane, M. Ackerman, N. Vu, M. Campbell. 2016. Parentage Based Tagging of Snake River Hatchery Steelhead and Chinook salmon. Idaho Department of Fish and Game. Report 16-02. Boise
- TAC 2008. *U.S. v Oregon* Technical Advisory Committee. Biological Assessment of Incidental Impacts on Salmon Species Listed Under the Endangered Species Act in the 2008-2017 Non-Indian and Treaty Indian Fisheries in the Columbia River Basin. April 21, 2008.
- Watts, James W. February 2013 (in draft). The 2011 Lower Columbia River and Buoy 10 Recreational Fisheries. Oregon Department of Fish and Wildlife. Columbia River Management. Clackamas.

Table 1. Summer steelhead smolt releases by region and brood year (BY) in the Columbia River basin. Upst BON = releases upstream of Bonneville Dam. MY = smolt migration year.

Region - BY – (MY)	Clipped	Unclipped	Total	Percent of	
				Total	Upst BON
BY2015 (MY2016)	13,146,505	1,399,559	14,546,064		
Lower Columbia	3,459,308	11,292	3,470,600	23.9%	--
Mid-C	409,608	66,838	476,446	3.3%	4.3%
Snake	8,401,064	1,170,739	9,571,803	65.8%	86.4%
Upper Columbia	876,525	150,690	1,027,215	7.1%	9.3%
BY2014 (MY2015)	12,058,296	1,416,086	13,474,382		
Lower Columbia	1,903,788	6,035	1,909,823	14.2%	--
Mid-C	626,579	116,068	742,647	5.5%	6.4%
Snake	8,796,149	1,089,369	9,885,518	73.4%	85.5%
Upper Columbia	731,780	204,614	936,394	6.9%	8.1%
BY2013 (MY2014)	11,680,047	1,308,409	12,988,456		
Lower Columbia	2,018,054	1,387	2,019,441	15.5%	--
Mid-C	620,728	64,797	685,525	5.3%	6.2%
Snake	8,261,245	1,078,245	9,339,490	71.9%	85.1%
Upper Columbia	780,020	163,980	944,000	7.3%	8.6%

^a all rivers downstream of Bonneville Dam including the Willamette River basin.

^b all rivers from Bonneville Dam to the Yakima River, excluding the Snake River basin.

^c all rivers upstream of the Yakima River

Table 2. Lower Columbia River sport harvest and samples collected monthly from June 16 to October 31, 2017 and the total harvest from June 16 to October 31 from 2014 to 2016. Although nine fish were reported kept in August 2017, retention of steelhead was not permitted that month.

Month	Harvest	Percent of harvest	Ideal allocation	Samples analyzed	Percent of samples
June 16 - June 30	401	23.9%	57	43	18.1%
July	1,038	61.9%	147	173	72.7%
August	9	0.5%	1	0	0.0%
September	194	11.6%	28	19	8.0%
October	34	2.0%	5	3	1.3%
2017 total	1,676		238		
2016 total	6,112				
2015 total	8,772				
2014 total	13,336				

Table 3. Samples collected in sport fisheries in the main stem Columbia River and the Snake River downstream of the Idaho/Washington border from July 1 to December 31, 2017.

Fishery area	July	August	September	October	December	Total
Bonneville Pool	0	0	6	4	0	10
Drano Lake	4	0	0	0	0	4
John Day Pool	0	0	0	0	4	4
The Dalles Pool	0	1	0	0	0	1
mouth of Wind River	0	0	4	0	0	4
McNary Pool	0	0	9	0	10	19
lower Snake River	0	0	0	0	17	21

Table 4. Chinook, sockeye, and steelhead harvest in the Tribal Zone 6 fishery during the 2017 summer management period and the number of clipped and unclipped steelhead samples analyzed. The total steelhead harvest for the prior three summer seasons is also shown. Platform and hook and line fishing was open the entire season. There was no set net fishery in statistical week 25 and 32.

Set net fishery dates	Stat week	Adult Chinook harvest	Sockeye harvest	Steelhead harvest			Number of samples	
				Clip	Unclip	Total	Clip	Unclip
6/16 - 6/17	25	532	80	22	0	22	0	0
6/19 - 6/22	26	4,113	1,487	135	12	147	0	1
6/26 - 6/29	27	4,781	1,438	102	0	102	1	1
7/3 - 7/6	28	3,020	904	99	26	125	4	7
7/12 - 7/15	29	1,945	409	72	46	118	5	9
7/19 - 7/22	30	1,170	109	81	38	119	2	3
7/24 - 7/28	31	1,299	53	229	74	303	0	1
7/30 - 7/31	32	75	0	0	0	0	0	0
Total for 2017		16,935	4,480	740	196	936	12	22
2016 total				2,109	1,053	3,161		
2015 total				1,688	1,178	2,866		
2014 total				5,245	3,543	8,788		

Table 5. Chinook, coho, and steelhead harvest in the Tribal Zone 6 fishery during the 2017 fall management period and the number of clipped and unclipped steelhead samples analyzed. The total steelhead harvest for the prior three fall seasons is also shown. Platform and hook and line fishing was open from August 1 to November 30. There was no set net fishing from August 1 to August 20 and October 6 to November 30, 2017.

Set net fishery dates	Stat week	Adult Chinook harvest	Coho harvest	Steelhead harvest			Clip steelhead			Unclip steelhead		
				Clip	Unclip	Total	Percent harvest	Samples analyzed	Percent samples	Percent harvest	Samples analyzed	Percent samples
8/1 - 8/20	32 to 34	602	0	330	60	390	5.0%	11	3.2%	3.2%	8	5.6%
8/21 - 8/25	35	4,485	22	509	165	674	7.8%	93	26.8%	8.8%	48	33.6%
8/28 - 9/1	36	12,571	88	444	145	589	6.8%	36	10.4%	7.7%	9	6.3%
9/4 - 9/8	37	14,574	138	392	60	452	6.0%	3	0.9%	3.2%	1	0.7%
9/11 - 9/15	38	42,098	1,653	918	281	1,199	14.0%	31	8.9%	14.9%	13	9.1%
9/18 - 9/22	39	26,940	3,085	2,016	521	2,536	30.7%	118	34.0%	27.7%	48	33.6%
9/25 - 9/29	40	14,091	2,429	1,259	327	1,586	19.2%	44	12.7%	17.4%	10	7.0%
10/2 - 10/5	41	5,864	897	480	253	733	7.3%	11	3.2%	13.4%	6	4.2%
10/9 - 11/30	42 to 49	449	418	210	70	280	3.2%	0	0.0%	3.7%	0	0.0%
2017 Fall total		121,674	8,731	6,558	1,881	8,439		347			143	
2016 total				9,060	4,489	13,549						
2015 total				10,385	6,186	16,571						
2014 total				14,897	10,564	25,461						

Table 6. Description of hatchery stocks, release groups, and tag rates for Brood Year (BY) 2013 to 2015 that were included in the PBT parental baseline used to make assignments for steelhead returning to the Columbia River in 2017. Three ocean adults were from BY2013, two ocean adults from BY2015, and one ocean adults from BY2016. ns = not sampled. At Wells Hatchery the Omak and Okanogan release groups were not tracked separately until BY2015.

Hatchery Stock--program	Release group	BY2013	BY2014	BY2015
<u>Snake basin hatchery stocks</u>				
Dworshak-Clearwater basin releases	Dwor-C	0.9631	0.9872	0.8870
Dworshak-Salmon basin releases	Dwor-S	0.9787	0.9884	0.8125
EF Salmon - spawned at Sawtooth	EF Salmon	0.9167	1.0000	1.0000
Imnaha	Imnaha	0.7277	0.9550	0.8822
Oxbow	Oxbow	0.9709	0.9701	0.9278
Pahsimeroi - all smolt relases	Pahsimeroi	0.9944	0.9962	0.9209
Sawtooth - all smolt releases	Sawtooth	0.9965	0.9942	0.9415
SF Clearwater	SF Clearwater	1.0000	1.0000	0.9356
Touchet	Touchet	1.0000	1.0000	1.0000
Tucannon	Tucannon	1.0000	0.9697	0.8667
Upper Salmon	Upper Salmon	0.9579	1.0000	0.7156
Wallowa - Cottonwood release	Cottonwood	1.0000	0.9939	0.9322
Wallowa - all other sites	Wallowa	0.9102	0.9959	0.9435
<u>Non Snake basin hatchery stocks</u>				
Eastbank Hatchery--Wenatchee stock	Wenatchee	0.5474	0.3433	0.9134
Methow Hatchery--Twisp stock (unclip)	Twisp	1	1	0.9212
Umatilla Hatchery	Umatilla	0.9437	1	0.9777
Parkdale Hatchery - Hood River stock	Hood River	0.9529	0.9518	1
Round Butte Hatchery - Deschutes stock	Deschutes	0.9766	0.9913	0.9824
Wells Hatchery--all releases	Wells	0.9912	0.9739	--
Wells Hatchery - Omak stock	Omak	--	--	0.9664
Wells Hatchery - Okanogan stock	Okanogan	--	--	0.9853
Winthrop Hatchery - Winthrop stock	Winthrop	1	0.9712	0.7656
Skamania Hatchery-summer run	Skamania	0.9915	1	1

Table 7. Distinct group assignments made in all sport and tribal fisheries with their stock and basin assignments. We identified 38 distinct PBT release groups and 12 distinct GSI reporting groups. The MGILCS GSI group and the SKAMAN GSI group and Skamania PBT group span more than one basin, hence we used treated them as a distinct basin when discussing results at the basin spatial scale.

Group	Brood years	Stock	Basin	Type
<u>PBT release groups</u>				
Deschutes	2014, 2015	Deschutes	Mid-C	PBT
Touchet	2015	Touchet	Mid-C	PBT
Umatilla	2015	Umatilla	Mid-C	PBT
Cottonwood	2013, 2014, 2015, 2016	Wallowa	Snake	PBT
Dwor-C	2013, 2014, 2015	Dwor-C	Snake	PBT
EF Salmon	2015	EF Salmon	Snake	PBT
Imnaha	2014, 2015	Imnaha	Snake	PBT
Oxbow	2013, 2014, 2015	Oxbow	Snake	PBT
Pahsimeroi	2013, 2014, 2015	Pahsimeroi	Snake	PBT
Sawtooth	2013, 2014, 2015	Sawtooth	Snake	PBT
SF Clearwater	2014, 2015	SF Clearwater	Snake	PBT
Tucannon	2015	Tucannon	Snake	PBT
Upper Salmon	2013, 2015	Upper Salmon	Snake	PBT
Wallowa	2013, 2014, 2015	Wallowa	Snake	PBT
Okanogan	2015	Okanogan	Up-C	PBT
Omak	2015	Omak	Up-C	PBT
Wells	2014	Wells	Up-C	PBT
Winthrop	2014	Winthrop	Up-C	PBT
Skamania	2013, 2014, 2015	Skamania	SKAMAN	PBT
<u>GSI reporting groups</u>				
SKAMAN	--	SKAMAN	SKAMAN	GSI
LOWCOL	--	LOWCOL	Low-C	GSI
MGILCS	--	MGILCS	MGILCS	GSI
BWSALM	--	BWSALM	Mid-C	GSI
KLICKR	--	KLICKR	Mid-C	GSI
YAKIMA	--	YAKIMA	Mid-C	GSI
MFSALM	--	MFSALM	Snake	GSI
SFCLWR	--	SFCLWR	Snake	GSI
SFSALM	--	SFSALM	Snake	GSI
UPCLWR	--	UPCLWR	Snake	GSI
UPSALM	--	UPSALM	Snake	GSI
UPPCOL	--	UPPCOL	Up-C	GSI

Table 8. Re-allocation table used to subtract samples from GSI reporting groups after expanding the hatchery release groups by their PBT tag rate. For each hatchery release group the proportions that assigned to each GSI reporting group is shown. The release groups shaded in grey were combined to calculate one proportion for all of the groups. n = number of assignments used to calculate the proportions.

Hatchery release group	n	BWSALM	KLICKR	LOWCOL	MFSALM	MGILCS	SFCLWR	SFSALM	SKAMAN	UPCLWR	UPPCOL	UPSALM	WILLAM	YAKIMA
Cottonwood	625	0	0	0	0.0064	0.9248	0	0	0	0.0048	0.0048	0.056	0	0.0032
Deschutes	128	0	0	0	0.0234	0.8672	0	0.0156	0	0	0.0234	0.0313	0	0.0391
Dwor-C	1,365	0	0	0	0	0.0635	0.8988	0	0	0.0365	0	0.0012	0	0
Dwor-S	48	0	0	0	0	0.0635	0.8988	0	0	0.0365	0	0.0012	0	0
Dworshak	256	0	0	0	0	0.0635	0.8988	0	0	0.0365	0	0.0012	0	0
EF Salmon	68	0	0.0147	0	0.0147	0.4559	0.0441	0	0	0.0147	0	0.4559	0	0
Hood River	3	0	0	0	0	0.3334	0.3333	0	0	0	0	0.3333	0	0
Imnaha	154	0	0	0	0.0065	0.9545	0	0	0	0.0065	0.0065	0.026	0	0
Lyons Ferry	129	0	0	0	0	0.5891	0	0	0	0.0155	0.3876	0.0078	0	0
Oxbow	395	0	0	0	0.0076	0.3797	0	0	0	0.0025	0.0127	0.5975	0	0
Pahsimeroi	1,057	0	0	0	0.0114	0.3888	0	0	0	0.0009	0.0104	0.5828	0	0.0057
Sawtooth	507	0	0	0	0.0071	0.2726	0	0	0	0	0.0071	0.7114	0	0.0018
SBT_Indian	1	0	0	0	0.0071	0.2726	0	0	0	0	0.0071	0.7114	0	0.0018
SBT_Yankee	57	0	0	0	0.0071	0.2726	0	0	0	0	0.0071	0.7114	0	0.0018
SF Clearwater	98	0	0	0	0	0.0408	0.949	0	0	0.0102	0	0	0	0
Skamania	177	0	0	0	0	0	0	0	0.9944	0	0	0	0.0056	0
Touchet	18	0	0	0	0	1	0	0	0	0	0	0	0	0
Tucannon	40	0	0	0	0	0.825	0.025	0	0	0	0.125	0.025	0	0
Umatilla	91	0	0	0	0.022	0.8021	0	0	0	0	0.044	0.1099	0	0.022
Upper Salmon	170	0	0	0	0	0.5439	0.2912	0	0	0.044	0	0.1154	0	0.0055
USAL_Yankee	12	0	0	0	0	0.5439	0.2912	0	0	0.044	0	0.1154	0	0.0055
Wallowa	699	0	0	0	0.0072	0.9199	0.0014	0	0	0.0043	0.0186	0.0429	0	0.0057
Twisp	4	0	0	0	0.0081	0.5366	0	0	0	0	0.3577	0.0854	0	0.0122
Wells	214	0	0	0	0.0081	0.5366	0	0	0	0	0.3577	0.0854	0	0.0122
Winthrop	8	0	0	0	0.0081	0.5366	0	0	0	0	0.3577	0.0854	0	0.0122
Okanogan	17	0	0	0	0.0081	0.5366	0	0	0	0	0.3577	0.0854	0	0.0122
Omak	3	0	0	0	0.0081	0.5366	0	0	0	0	0.3577	0.0854	0	0.0122

Table 9. Preliminary TAC steelhead passage estimates at Bonneville Dam and dam counts of clipped and unclipped steelhead at Bonneville Dam, McNary Dam and Ice Harbor dams from July 1 to October 31, 2017.

Strata Start Date	Strata End Date	Total count	Clip Count	Unclip Count	A-Index Hatchery Clip passage	A-Index Hatchery Unclip passage	A-Index Wild passage	B-Index Hatchery Clip passage	B-Index Hatchery Unclip passage	B-Index Wild passage
7/1	7/23	8,613	3,649	4,964	3,649	0	4,917	0	0	47
7/24	7/30	7,978	3,888	4,090	3,888	174	3,916	0	0	0
7/31	8/27	48,428	33,590	14,838	33,590	1,124	13,489	0	0	225
8/28	9/24	38,952	32,217	6,735	31,200	1,225	4,490	1,017	612	408
9/25	10/8	6,917	5,652	1,265	4,893	422	633	759	141	70
10/9	10/31	2,462	1,713	749	1,384	232	465	329	52	0
Bonneville Dam total		113,350	80,709	32,641	78,603	3,177	27,909	2,106^a	804	751
Bonneville pre-season^b		119,400			79,100		33,000	6,200		1,100
McNary Dam total		78,263	56,464	21,804						
Ice Harbor Dam total		60,818	48,273	12,545						

^a More B-Index hatchery clipped steelhead passed Bonneville Dam than the preliminary TAC estimate. The IDFG estimate for this group at Lower Granite Dam was about 3,800.

^b The Bonneville Dam pre-season hatchery clip forecasts includes unclipped hatchery origin fish.

Table 10. Composition+ and harvest estimates by PBT release group and GSI reporting group in the lower Columbia River sport fishery, June 16 to October 31, 2017. All fish harvested were adipose clipped hatchery origin. GSI assignments were made for fish that did not assign to a PBT release group.

Group and BY	Stock	Sample size		Group percent	90% lci	90% uci	Harvest		
		Actual	Adjust				estimate	90% lci	90% uci
All PBT assigned		152	159.5	67.0%	61.5%	72.3%	1,123	1,030	1,212
<i>Skamania PBT assigned</i>		34	34.1	14.3%	10.5%	18.1%	240	176	303
Skamania2013	Skamania	7	7.1	3.0%	1.3%	5.1%	50	21	85
Skamania2014	Skamania	26	26.0	10.9%	7.6%	14.3%	183	127	239
Skamania2015	Skamania	1	1.0	0.4%	0.0%	1.3%	7	0	21
<i>Mid-C basin PBT assigned</i>		13	13.2	5.5%	3.0%	8.1%	93	50	136
Deschutes2014	Deschutes	5	5.0	2.1%	0.8%	3.8%	36	14	64
Deschutes2015	Deschutes	8	8.1	3.4%	1.7%	5.6%	57	29	93
<i>Snake basin PBT assigned</i>		94	101.0	42.4%	36.8%	48.0%	711	617	805
Cottonwood2014	Wallowa	4	4.0	1.7%	0.4%	3.4%	28	7	57
Cottonwood2015	Wallowa	10	10.7	4.5%	2.3%	6.8%	76	38	113
Dwor-C2013	Dwor-C	1	1.0	0.4%	0.0%	1.3%	7	0	22
Dwor-C2014	Dwor-C	6	6.1	2.6%	0.9%	4.3%	43	14	71
Dwor-C2015	Dwor-C	4	4.5	1.9%	0.5%	3.3%	32	8	56
Imnaha2014	Imnaha	2	2.1	0.9%	0.0%	2.2%	15	0	37
Imnaha2015	Imnaha	11	12.5	5.2%	2.9%	8.1%	88	48	136
Oxbow2013	Oxbow	1	1.0	0.4%	0.0%	1.3%	7	0	22
Oxbow2014	Oxbow	1	1.0	0.4%	0.0%	1.3%	7	0	22
Oxbow2015	Oxbow	8	8.6	3.6%	1.8%	5.9%	61	30	99
Pahsimeroi2014	Pahsimeroi	3	3.0	1.3%	0.4%	2.5%	21	7	42
Pahsimeroi2015	Pahsimeroi	13	14.1	5.9%	3.2%	8.7%	99	54	145
Sawtooth2015	Sawtooth	12	12.7	5.4%	3.1%	8.0%	90	52	135
SF Clearwater2015	SF Clearwater	1	1.1	0.4%	0.0%	1.3%	8	0	23
Tucannon2015	Tucannon	1	1.2	0.5%	0.0%	1.5%	8	0	24

Table 10. (continued)

Group and BY	Stock	Sample size		Group percent	90% lci	90% uci	Harvest		
		Actual	Adjust				estimate	90% lci	90% uci
Upper Salmon2015	Upper Salmon	1	1.4	0.6%	0.0%	1.8%	10	0	30
Wallowa2015	Wallowa	15	15.9	6.7%	4.0%	9.4%	112	67	157
<u>Up-C basin PBT assigned</u>		11	11.2	4.7%	2.6%	7.3%	79	43	122
Okanogan2015	Okanogan	6	6.1	2.6%	0.9%	4.3%	43	14	71
Wells2014	Wells	2	2.1	0.9%	0.0%	2.2%	14	0	36
Winthrop2014	Winthrop	3	3.1	1.3%	0.4%	2.6%	22	7	44
<u>Hatchery origin GSI assigned</u>		86	78.5	33.0%	27.7%	38.5%	553	464	646
KLICKR	KLICKR	1	0.0	0.0%	0.0%	0.6%	0	0	10
LOWCOL	LOWCOL	18	16.0	6.7%	3.9%	9.7%	113	66	162
MGILCS	MGILCS	2	0.0	0.0%	0.0%	0.1%	0	0	2
SKAMAN	SKAMAN	64	62.5	26.3%	21.4%	31.0%	440	358	519
UPPCOL	UPPCOL	1	0.0	0.0%	0.0%	0.6%	0	0	9

Table 11. Composition and harvest estimates of the PBT assigned hatchery stocks in the lower Columbia River sport fishery, June 16 to October 31, 2017. All harvested fish were adipose clipped hatchery origin.

Stock	Sample size		Stock percent	90% lci	90% uci	Harvest		
	Actual	Adjusted				estimate	90% lci	90% uci
Skamania	34	34.1	14.3%	10.5%	18.1%	240	176	303
<u>Mid-C basin stocks</u>	13	13.2	5.5%	3.0%	8.1%	93	50	136
Deschutes	13	13.2	5.5%	3.0%	8.1%	93	50	136
<u>Snake basin stocks</u>	94	101.0	42.4%	36.8%	48.0%	711	617	805
Dwor-C	11	11.6	4.9%	2.6%	7.2%	82	44	121
Imnaha	13	14.6	6.1%	3.3%	8.9%	103	56	150
Oxbow	10	10.7	4.5%	2.3%	6.8%	75	38	114
Pahsimeroi	16	17.1	7.2%	4.5%	10.3%	121	75	172
Sawtooth	12	12.7	5.4%	3.1%	8.0%	90	52	135
SF Clearwater	1	1.1	0.4%	0.0%	1.3%	8	0	23
Tucannon	1	1.2	0.5%	0.0%	1.5%	8	0	24
Upper Salmon	1	1.4	0.6%	0.0%	1.8%	10	0	30
Wallowa	29	30.7	12.9%	9.3%	16.5%	216	156	276
<u>Up-C basin stocks</u>	11	11.2	4.7%	2.6%	7.3%	79	43	122
Okanogan	6	6.1	2.6%	0.9%	4.3%	43	14	71
Wells	2	2.1	0.9%	0.0%	2.2%	14	0	36
Winthrop	3	3.1	1.3%	0.4%	2.6%	22	7	44
PBT Unassigned	86	78.5	33.0%	27.7%	38.5%	553	464	646

Table 12. Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the lower Columbia River sport harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 26.9% of all large fish sampled came from the Dwor-C stock and 63.6% of the fish within the Dwor-C stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if ≥ 10 fish were sampled.

Stock	Actual count	Count by Brood Year			Percent 1-Ocean	Percent Female	Percent Large	
		2013	2014	2015			of total	within
Skamania	34	7	26	1	2.9%	64.7%	19.2%	14.7%
<u>Mid-C basin PBT assigned stocks</u>					61.5%	25.0%	0.0%	
Deschutes	13	0	5	8	61.5%	25.0%	0.0%	0.0%
<u>Snake basin PBT assigned stocks</u>					80.2%	54.3%	26.9%	
Dwor-C	11	1	6	4	36.4%	18.2%	26.9%	63.6%
Oxbow	10	1	1	8	80.0%	80.0%	0.0%	0.0%
Pahsimeroi	16	0	3	13	81.3%	62.5%	0.0%	0.0%
Sawtooth	12	0	0	12	100.0%	58.3%	0.0%	0.0%
SF Clearwater	1	0	0	1	--	--	0.0%	--
Tucannon	1	0	0	1	--	--	0.0%	--
Upper Salmon	1	0	0	1	--	--	0.0%	--
Wallowa	29	0	4	25	86.2%	55.2%	0.0%	0.0%
<u>Up-C basin PBT assigned stocks</u>					75.0%	45.5%	0.0%	
Okanogan	6	0	0	6	--	--	0.0%	--
Wells	2	0	2	0	--	--	0.0%	--
<u>Hatchery origin fish GSI assigned</u>						58.1%	53.8%	
KLICKR	1					--	0.0%	--
LOWCOL	18					61.1%	3.8%	5.6%
MGILCS	2					--	0.0%	--
SKAMAN	64					56.3%	50.0%	20.3%
UPPCOL	1					--	0.0%	--
<u>All PBT assigned fish</u>					59.9%	53.6%	46.2%	
<u>All fish</u>						55.3%	10.9%	

Table 13. Composition and harvest estimates of clipped steelhead by PBT release group and GSI reporting group in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017. All fish harvested were adipose clipped hatchery origin. GSI assignments were made for fish that did not assign to a PBT release group.

Group and BY	Stock	Sample size		Group percent	90% lci	90% uci	Harvest		
		Actual	Adjust				estimate	90% lci	90% uci
All PBT assigned		313	332.7	95.9%	93.0%	98.7%	6,288	6,100	6,471
<i>Skamania PBT assigned</i>		1	1.0	0.3%	0.0%	0.9%	19	0	57
Skamania2014	Skamania	1	1.0	0.3%	0.0%	0.9%	19	0	57
<i>Mid-C basin PBT assigned</i>		7	7.1	2.0%	0.9%	3.5%	134	58	230
Deschutes2014	Deschutes	2	2.0	0.6%	0.0%	1.5%	38	0	96
Deschutes2015	Deschutes	3	3.0	0.9%	0.3%	1.7%	57	19	114
Umatilla2015	Umatilla	2	2.0	0.6%	0.0%	1.2%	39	0	78
<i>Snake basin PBT assigned</i>		292	311.4	89.8%	86.4%	93.2%	5,886	5,669	6,112
Cottonwood2014	Wallowa	8	8.0	2.3%	1.2%	3.8%	152	76	247
Cottonwood2015	Wallowa	34	36.5	10.5%	7.7%	13.3%	689	508	875
Dwor-C2013	Dwor-C	4	4.2	1.2%	0.3%	2.4%	78	20	157
Dwor-C2014	Dwor-C	23	23.3	6.7%	4.7%	9.0%	440	306	593
Dwor-C2015	Dwor-C	7	7.9	2.3%	1.0%	3.6%	149	64	236
EF Salmon2015	EF Salmon	1	1.0	0.3%	0.0%	0.9%	19	0	57
Imnaha2014	Imnaha	1	1.0	0.3%	0.0%	0.9%	20	0	59
Imnaha2015	Imnaha	14	15.9	4.6%	2.6%	6.5%	300	172	428
Oxbow2014	Oxbow	6	6.2	1.8%	0.6%	3.0%	117	39	195
Oxbow2015	Oxbow	31	33.4	9.6%	6.9%	12.4%	631	450	815
Pahsimeroi2013	Pahsimeroi	1	1.0	0.3%	0.0%	0.9%	19	0	57
Pahsimeroi2014	Pahsimeroi	4	4.0	1.2%	0.3%	2.0%	76	19	134
Pahsimeroi2015	Pahsimeroi	68	73.8	21.3%	17.5%	25.0%	1,396	1,149	1,642
Sawtooth2014	Sawtooth	6	6.0	1.7%	0.6%	2.9%	114	38	191
Sawtooth2015	Sawtooth	31	32.9	9.5%	6.8%	12.2%	622	444	803
SF Clearwater2015	SF Clearwater	3	3.2	0.9%	0.0%	1.8%	61	0	121

Table 13. (continued)

Group and BY	Stock	Sample size		Group percent	90% lci	90% uci	Harvest		
		Actual	Adjust				estimate	90% lci	90% uci
Upper Salmon2015	Upper Salmon	1	1.4	0.4%	0.0%	1.2%	26	0	79
Wallowa2013	Wallowa	1	1.1	0.3%	0.0%	0.9%	21	0	62
Wallowa2014	Wallowa	6	6.0	1.7%	0.6%	2.9%	114	38	190
Wallowa2015	Wallowa	42	44.5	12.8%	9.8%	15.9%	841	642	1,045
<i>Up-C basin PBT assigned</i>		13	13.3	3.8%	2.1%	5.6%	251	136	367
Okanogan2015	Okanogan	8	8.1	2.3%	1.2%	3.8%	153	77	249
Omak2015	Omak	1	1.0	0.3%	0.0%	0.9%	20	0	59
Wells2014	Wells	2	2.1	0.6%	0.0%	1.5%	39	0	97
Winthrop2014	Winthrop	2	2.1	0.6%	0.0%	1.2%	39	0	78
<i>Hatchery origin GSI assigned</i>		34	14.2	4.1%	1.3%	6.7%	268	84	441
KLICKR	KLICKR	1	0.7	0.2%	0.0%	0.8%	13	0	50
MGILCS	MGILCS	20	8.6	2.5%	0.2%	4.4%	163	12	286
SFCLWR	SFCLWR	1	0.0	0.0%	0.0%	0.4%	0	0	26
SKAMAN	SKAMAN	1	0.8	0.2%	0.0%	0.8%	14	0	53
UPPCOL	UPPCOL	3	2.5	0.7%	0.0%	1.6%	48	0	105
UPSALM	UPSALM	6	0.0	0.0%	0.0%	0.8%	0	0	55
YAKIMA	YAKIMA	2	1.6	0.5%	0.0%	1.1%	30	0	74

Table 14. Composition and harvest estimates of the clipped PBT assigned hatchery stocks in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017. All harvested fish were adipose clipped hatchery origin.

Stock	Sample size		Stock percent	90% lci	90% uci	Harvest		
	Actual	Adjusted				estimate	90% lci	90% uci
Skamania	1	1.0	0.3%	0.0%	0.9%	0	0	57
<u>Mid-C basin stocks</u>	7	7.1	2.0%	0.9%	3.5%	134	58	230
Deschutes	5	5.1	1.5%	0.6%	2.6%	96	38	172
Umatilla	2	2.0	0.6%	0.0%	1.2%	39	0	78
<u>Snake basin stocks</u>	292	311.4	89.8%	86.4%	93.2%	5,886	5,669	6,112
Dwor-C	34	35.3	10.2%	7.5%	13.0%	668	492	853
EF Salmon	1	1.0	0.3%	0.0%	0.9%	19	0	57
Imnaha	15	16.9	4.9%	2.9%	6.9%	320	192	450
Oxbow	37	39.6	11.4%	8.6%	14.4%	748	565	948
Pahsimeroi	73	78.9	22.7%	19.0%	26.7%	1,490	1,244	1,753
Sawtooth	37	39.0	11.2%	8.5%	14.3%	736	556	935
SF Clearwater	3	3.2	0.9%	0.0%	1.8%	61	0	121
Upper Salmon	1	1.4	0.4%	0.0%	1.2%	26	0	79
Wallowa	91	96.2	27.7%	23.7%	32.0%	1,817	1,556	2,098
<u>Up-C basin stocks</u>	13	13.3	3.8%	2.1%	5.6%	251	136	367
Okanogan	8	8.1	2.3%	1.2%	3.8%	0	77	249
Omak	1	1.0	0.3%	0.0%	0.9%	0	0	59
Wells	2	2.1	0.6%	0.0%	1.5%	0	0	97
Winthrop	2	2.1	0.6%	0.0%	1.2%	0	0	78
PBT Unassigned	34	14.2	4.1%	1.3%	6.7%	268	84	441

Table 15. Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the Zone 6 tribal clipped harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 68.2% of all large fish sampled came from the Dwor-C stock and 44.1% of the fish within the Dwor-C stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if ≥ 10 fish were sampled.

Stock	Actual count	Count by Brood Year			Percent 1-Ocean	Percent Female	Percent Large	
		2013	2014	2015			of total	within
Skamania	1	0	1	0	--	--	0.0%	--
<i>Mid-C basin PBT assigned stocks</i>					57.1%	28.6%	0.0%	
Deschutes	5	0	3	2	--	--	0.0%	--
Umatilla	2	0	0	2	--	--	0.0%	--
<i>Snake basin PBT assigned stocks</i>					79.5%	43.9%	90.9%	
Dwor-C	34	4	23	7	20.6%	52.9%	68.2%	44.1%
EF Salmon	1	0	0	1	--	--	0.0%	--
Imnaha	15	0	1	14	93.3%	50.0%	0.0%	0.0%
Oxbow	37	0	6	31	83.8%	35.1%	0.0%	0.0%
Pahsimeroi	73	1	4	68	93.2%	53.4%	9.1%	2.7%
Sawtooth	37	0	6	31	83.8%	38.9%	0.0%	0.0%
SF Clearwater	3	0	0	3	--	--	0.0%	--
Upper Salmon	1	0	0	1	--	--	0.0%	--
Wallowa	91	1	14	76	83.5%	38.9%	13.6%	3.4%
<i>Up-C basin PBT assigned stocks</i>					69.2%	38.5%	0.0%	
Okanogan	8	0	0	8	--	--	0.0%	--
Omak	1	0	0	1	--	--	0.0%	--
Wells	2	0	2	0				
Winthrop	2	0	2	0				
<i>Hatchery origin fish GSI assigned</i>						41.2%	9.1%	
KLICKR	1					--	0.0%	--
MGILCS	20					40.0%	4.5%	5.0%
SFCLWR	1					--	4.5%	--
SKAMAN	1					--	0.0%	--
UPPCOL	3					--	0.0%	--
UPSALM						--	0.0%	--
YAKIMA						--	0.0%	--
<i>All PBT assigned fish</i>					78.3%	43.5%	90.9%	
<i>All fish</i>					347	43.3%	6.4%	

Table 16. Composition and harvest estimates of unclipped steelhead by PBT release group and GSI reporting group in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017.

Group and BY	Stock	Sample size		Group percent	90% lci	90% uci	Harvest		
		Actual	Adjust				estimate	90% lci	90% uci
All PBT assigned		18	18.7	13.0%	8.6%	18.0%	245	162	339
<u>Mid-C basin PBT assigned</u>		1	1.0	0.7%	0.0%	2.1%	13	0	39
Touchet2015	Touchet	1	1.0	0.7%	0.0%	2.1%	13	0	39
<u>Snake basin PBT assigned</u>		13	13.6	9.5%	5.7%	13.8%	178	108	260
Cottonwood2014	Wallowa	1	1.0	0.7%	0.0%	2.1%	13	0	40
Cottonwood2015	Wallowa	2	2.1	1.5%	0.0%	3.8%	28	0	71
EF Salmon2015	EF Salmon	3	3.0	2.1%	0.7%	4.2%	39	13	79
Imnaha2014	Imnaha	1	1.0	0.7%	0.0%	2.2%	14	0	41
Sawtooth2015	Sawtooth	1	1.1	0.7%	0.0%	2.2%	14	0	42
SF Clearwater2014	SF Clearwater	2	2.0	1.4%	0.0%	3.5%	26	0	66
SF Clearwater2015	SF Clearwater	2	2.1	1.5%	0.0%	3.7%	28	0	70
Tucannon2015	Tucannon	1	1.2	0.8%	0.0%	2.4%	15	0	46
<u>Up-C basin PBT assigned</u>		4	4.1	2.9%	0.7%	5.1%	54	13	95
Okanogan2015	Okanogan	2	2.0	1.4%	0.0%	3.5%	27	0	67
Omak2015	Omak	2	2.1	1.4%	0.0%	2.9%	27	0	55
<u>Unclipped GSI assigned</u>		125	124.3	87.0%	82.0%	91.4%	1,636	1,542	1,719
KLICKR	KLICKR	2	2.0	1.4%	0.0%	3.4%	26	0	65
LOWCOL	LOWCOL	1	1.0	0.7%	0.0%	2.1%	13	0	39
MFSALM	MFSALM	6	6.0	4.2%	1.4%	7.0%	79	26	131
MGILCS	MGILCS	88	87.6	61.3%	55.0%	68.3%	1,152	1,034	1,284
SFSALM	SFSALM	3	3.0	2.1%	0.6%	4.2%	39	12	79
UPCLWR	UPCLWR	1	1.0	0.7%	0.0%	2.1%	13	0	39
UPPCOL	UPPCOL	5	4.9	3.4%	1.3%	6.2%	65	25	117
UPSALM	UPSALM	10	9.9	6.9%	3.4%	10.4%	130	65	196
YAKIMA	YAKIMA	9	9.0	6.3%	2.8%	9.8%	118	53	184

Table 17. Composition and harvest estimates of the unclipped PBT assigned hatchery stocks in the fall period Zone 6 tribal fishery, August 1 to November 30, 2017.

Stock	Sample size		Stock percent	90% lci	90% uci	Harvest		
	Actual	Adjusted				estimate	90% lci	90% uci
<u>Mid-C basin stocks</u>	1	1.0	0.7%	0.0%	2.1%	13	0	39
Touchet	1	1.0	0.7%	0.0%	2.1%	13	0	39
<u>Snake basin stocks</u>	13	13.6	9.5%	5.7%	13.8%	178	108	260
EF Salmon	3	3.0	2.1%	0.7%	4.2%	39	13	79
Imnaha	1	1.0	0.7%	0.0%	2.2%	14	0	41
Sawtooth	1	1.1	0.7%	0.0%	2.2%	14	0	42
SF Clearwater	4	4.1	2.9%	0.7%	5.6%	54	13	106
Tucannon	1	1.2	0.8%	0.0%	2.4%	15	0	46
Wallowa	3	3.2	2.2%	0.7%	4.5%	41	13	84
<u>Up-C basin stocks</u>	4	4.1	2.8%	0.7%	5.1%	54	13	95
Okanogan	2	2.0	1.4%	0.0%	3.5%	27	0	67
Omak	2	2.1	1.4%	0.0%	2.9%	27	0	55
PBT Unassigned	125	124.3	87.0%	82.0%	91.4%	1,636	1,542	1,719

Table 18. Percent of 1-ocean, female, and large fish (fork length ≥ 78 cm) by group in the Zone 6 tribal unclipped harvest. The percent large total column is the total number of large fish sampled that came from each group. The percent large within column is the percent of large fish within each group. For example, 37.5% of all large fish sampled came from the MGILCS stock and 3.5% of the fish within the MGILCS stock were large. All Brood Years were combined. Percentages of female, 1-ocean, and large within were calculated if ≥ 10 fish were sampled.

Stock	Actual count	Count by Brood Year			Percent 1-Ocean	Percent Female	Percent Large	
		2013	2014	2015			of total	within
<u>Mid-C basin PBT assigned stocks</u>								
Touchet	1	0	0	1	--	--	0.0%	--
					69.2%	46.2%	25.0%	
<u>Snake basin PBT assigned stocks</u>								
EF Salmon	3	0	0	3	--	--	0.0%	--
Imnaha	1	0	1	0	--	--	0.0%	--
Sawtooth	1	0	0	1	--	--	0.0%	--
SF Clearwater	4	0	2	2	--	--	25.0%	--
Tucannon	1	0	0	1	--	--	0.0%	--
Wallowa	3	0	1	2	--	--	0.0%	--
					100.0%	0.0%	0.0%	
<u>Up-C basin PBT assigned stocks</u>								
Okanogan	2	0	0	2	--	--	12.5%	--
Omak	2	0	0	2	--	--	0.0%	--
						60.8%	62.5%	
<u>Hatchery origin fish GSI assigned</u>								
Klickr	2					--	0.0%	--
Lowcol	1					--	12.5%	--
MFSALM	6					--	0.0%	--
MGILCS	88					61.4%	37.5%	3.5%
SFSALM	3					--	12.5%	--
UPCLWR	1					--	0.0%	--
UPPCOL	5					--	0.0%	--
UPSALM	10					80.0%	0.0%	0.0%
Yakima	9					--	0.0%	--
All fish	143						58.0%	5.7%

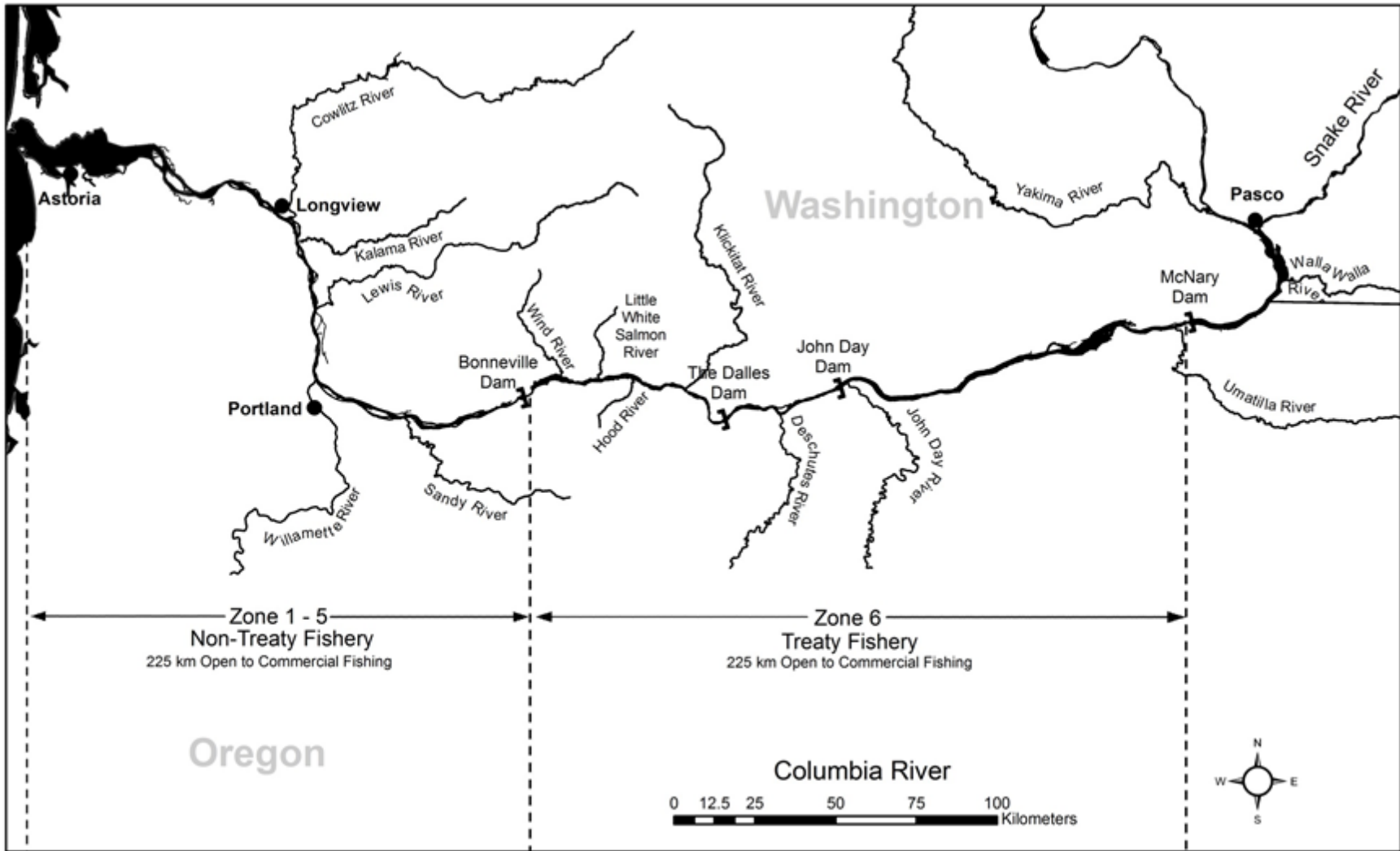


Figure 1. Map of the Columbia River where fisheries were sampled to determine steelhead stock composition. Sport anglers were sampled from the mouth upstream to Pasco and tribal fisheries were sampled upstream of Bonneville Dam in Zone 6.

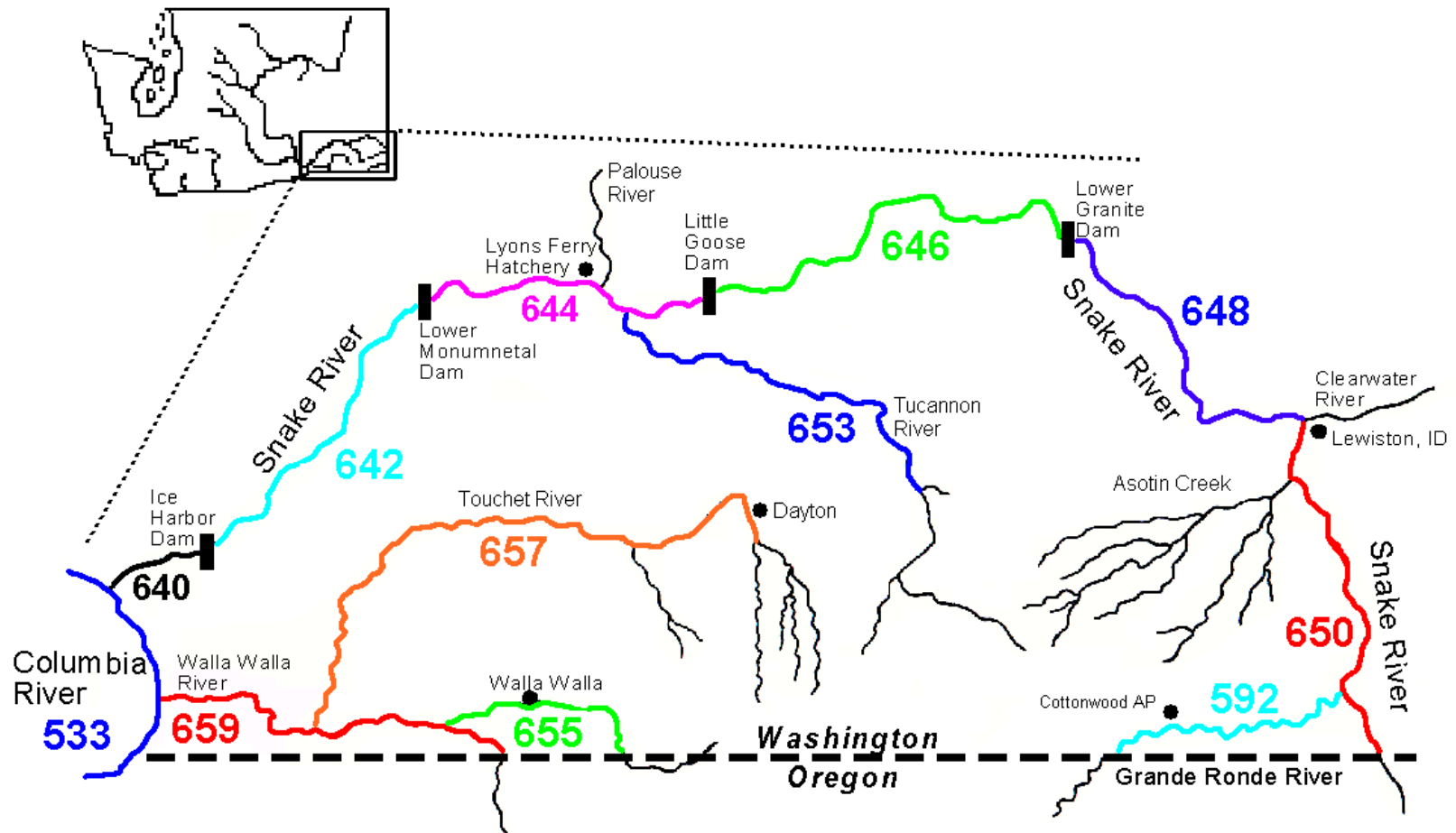


Figure 2. Map of the lower Snake River showing boundaries of the sections used by WDFW to estimate the monthly steelhead harvest. We estimated the steelhead stock composition from samples obtained in Sections 640, 642, 644, 646, and 648.

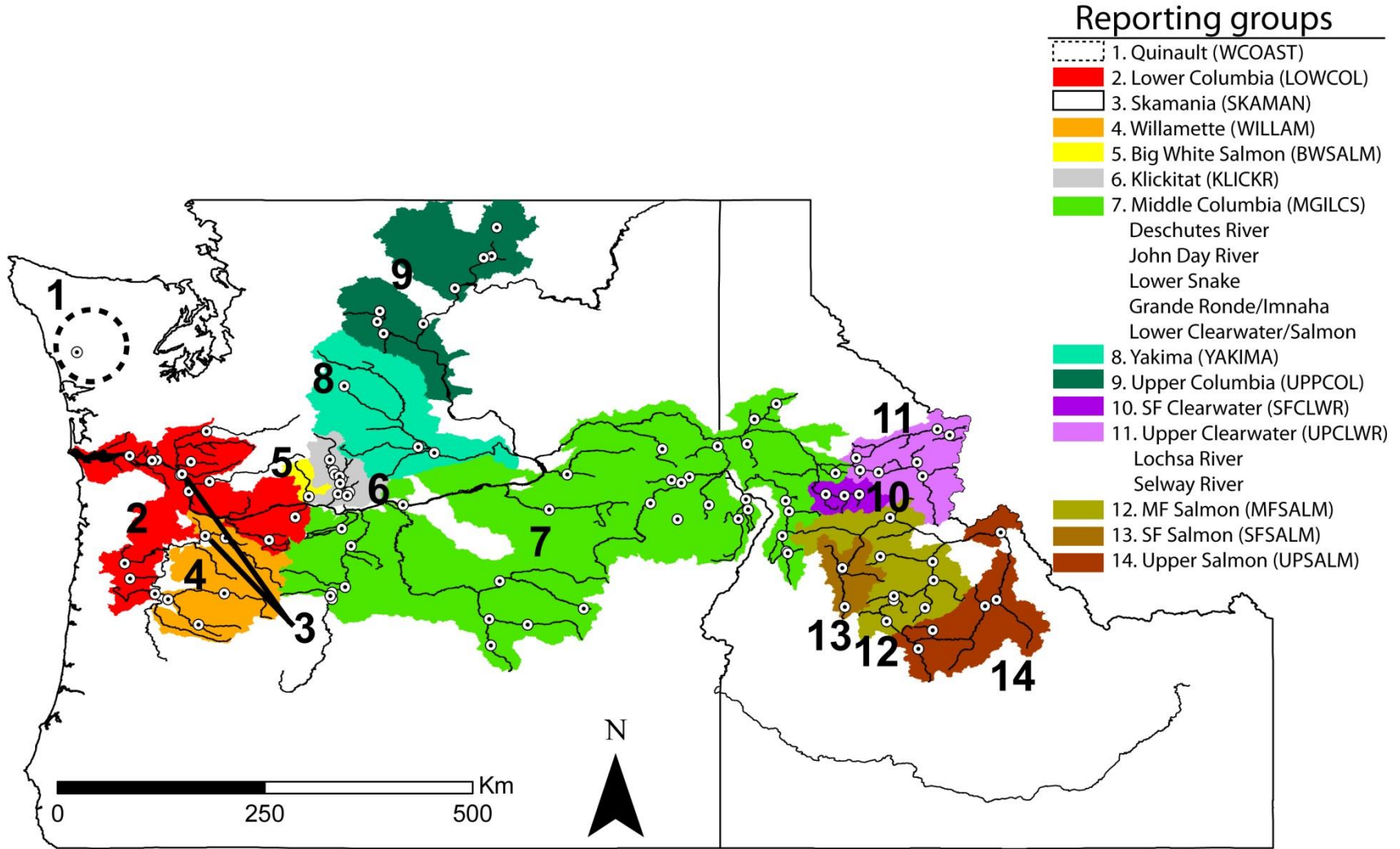


Figure 3. Map showing the GSI reporting groups that have been developed by CRITFC. These groups were used to assign adipose clipped and adipose unclipped steelhead that were not identified with PBT.

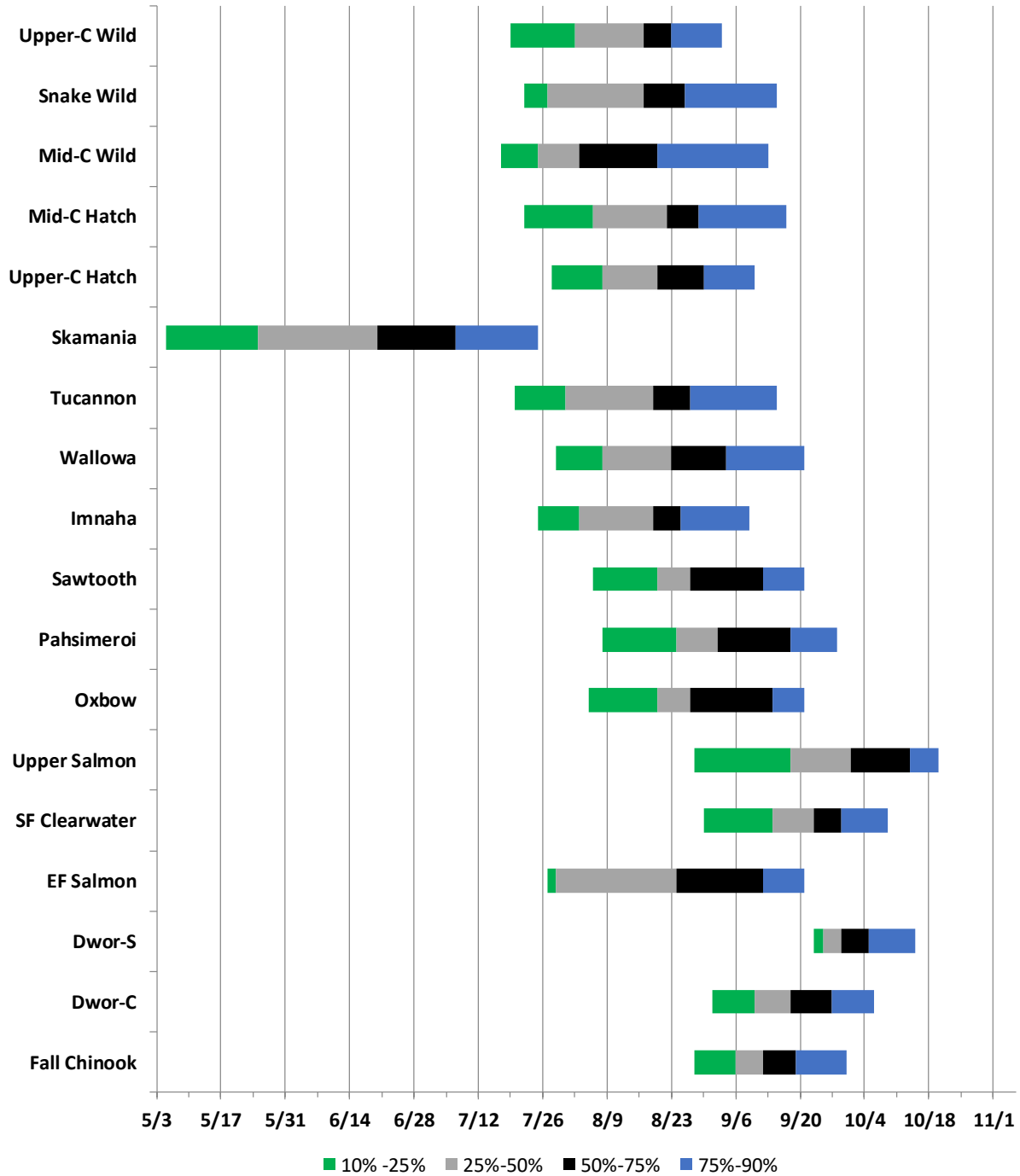


Figure 4. Run-timing of hatchery and wild summer steelhead stocks and fall Chinook at Bonneville Dam in 2017. Skamania stock is for fish released in the Klickitat River. Wild run timing in each region was calculated by combining all wild fish tagged as juveniles that returned as adults in 2017. The wild Snake River stock excludes fish tagged at Snake River dams

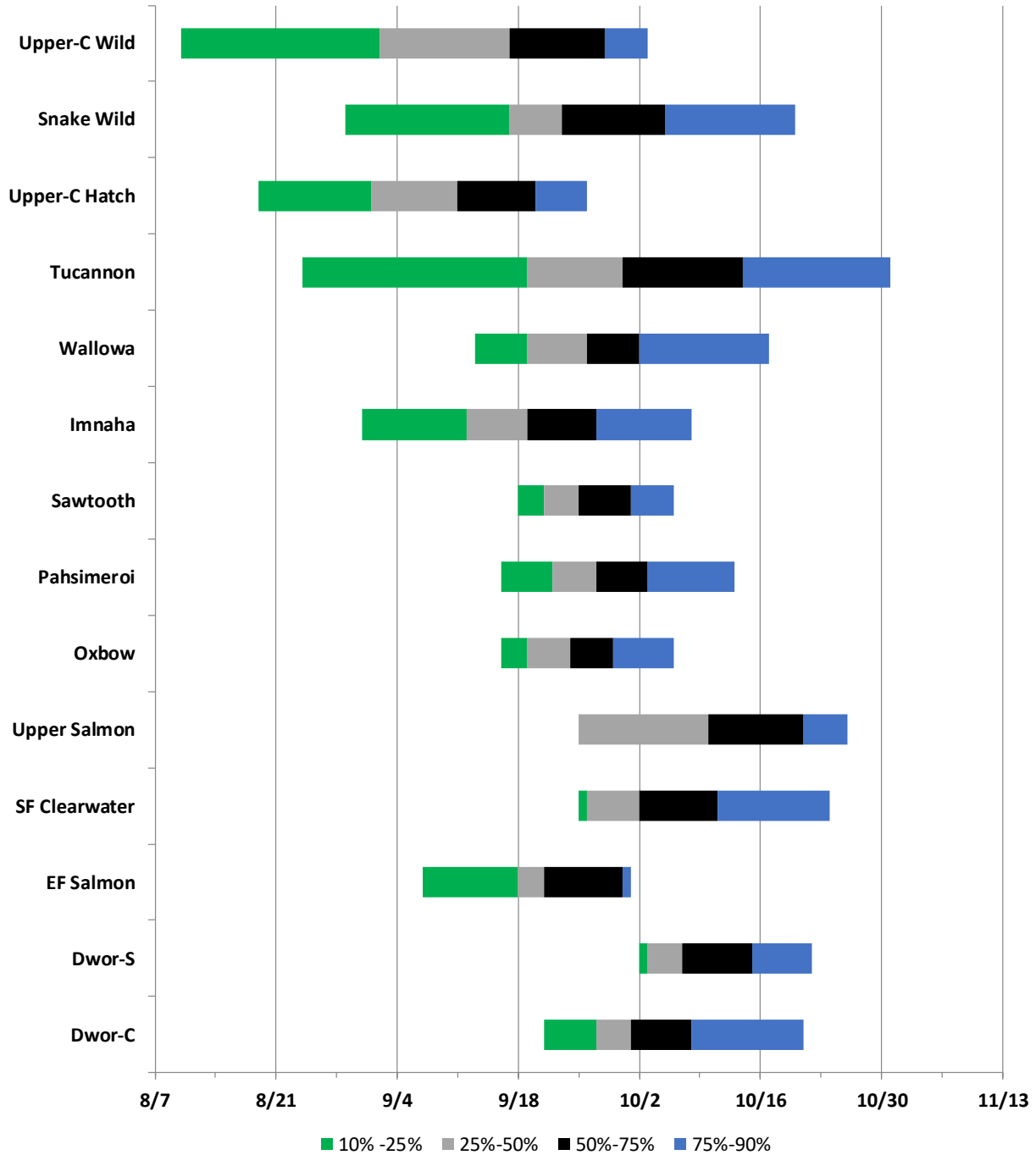


Figure 5. Run-timing of hatchery and wild steelhead stocks at McNary Dam in 2017. Wild run timing in each region was calculated by combining all wild fish tagged as juveniles that returned as adults in 2017. The wild Snake River stock excludes fish tagged at Snake River dams.

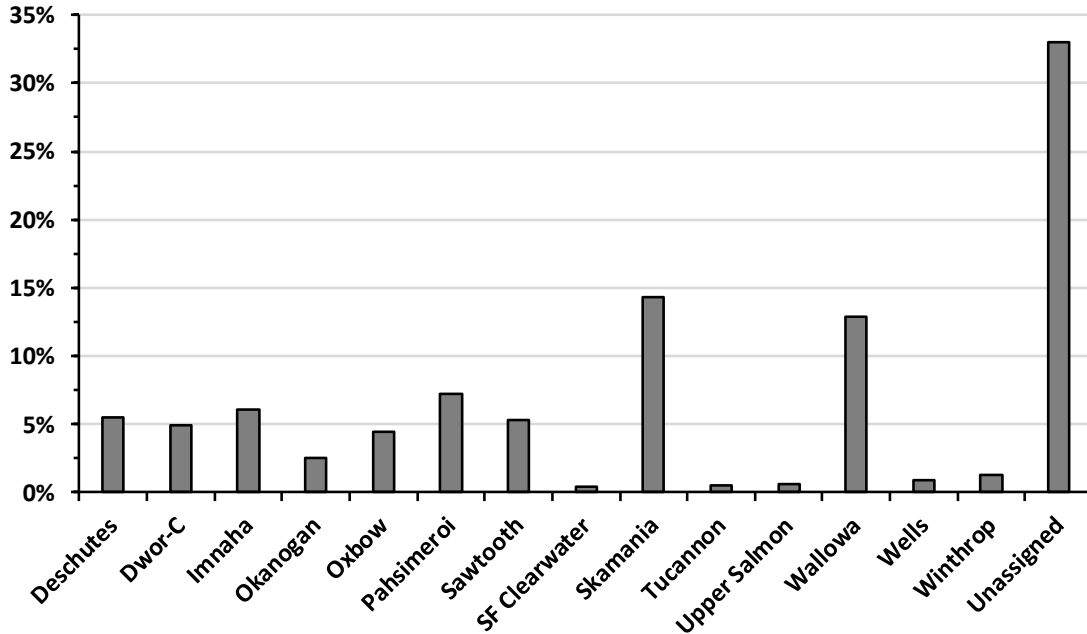


Figure 6. Hatchery stock composition in the Lower Columbia River sport fishery for the entire season, June 16 to October 31, 2017. Steelhead could not be kept in August.

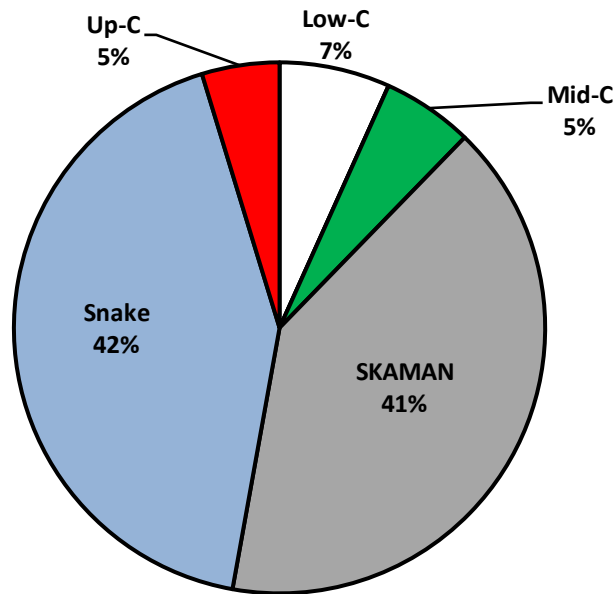


Figure 7. Harvest contribution by basin in the Lower Columbia River sport fishery, June 16 to October 31, 2017.

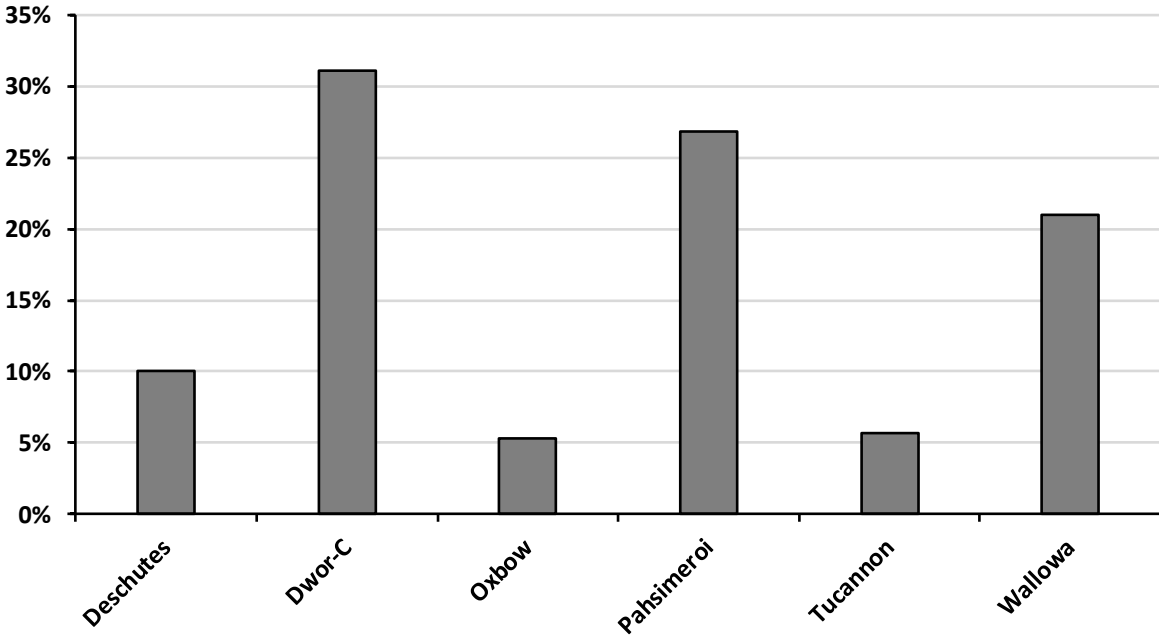


Figure 8. Hatchery stock composition of the 19 samples collected in the McNary Pool sport fishery.

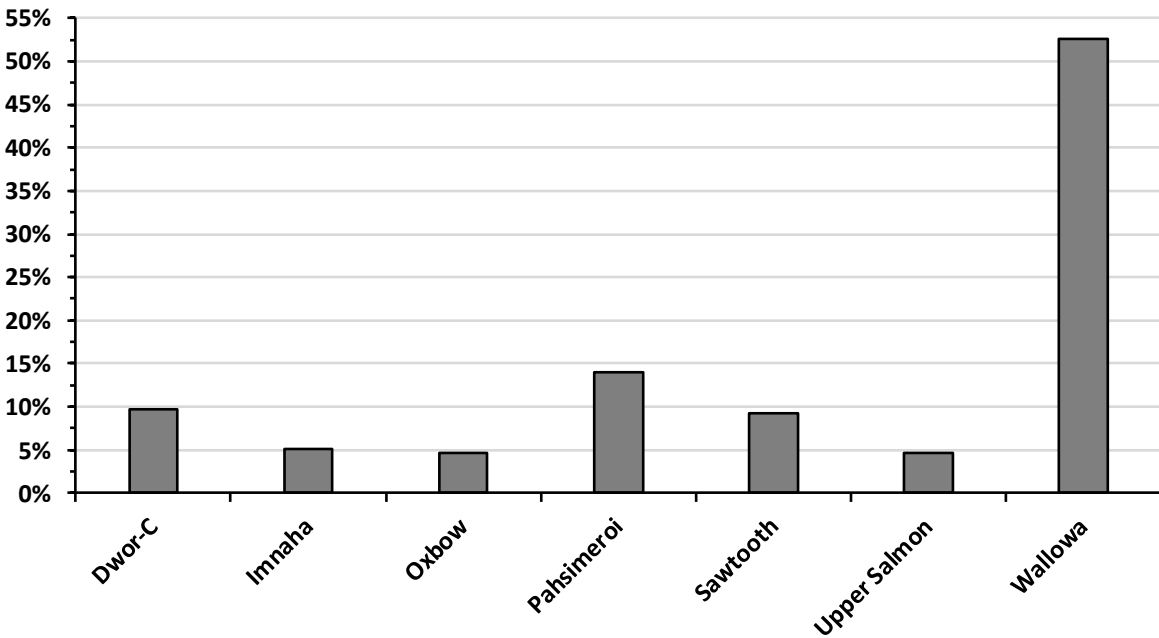


Figure 9. Hatchery stock composition of the 21 samples collected in the lower Snake River sport fishery.

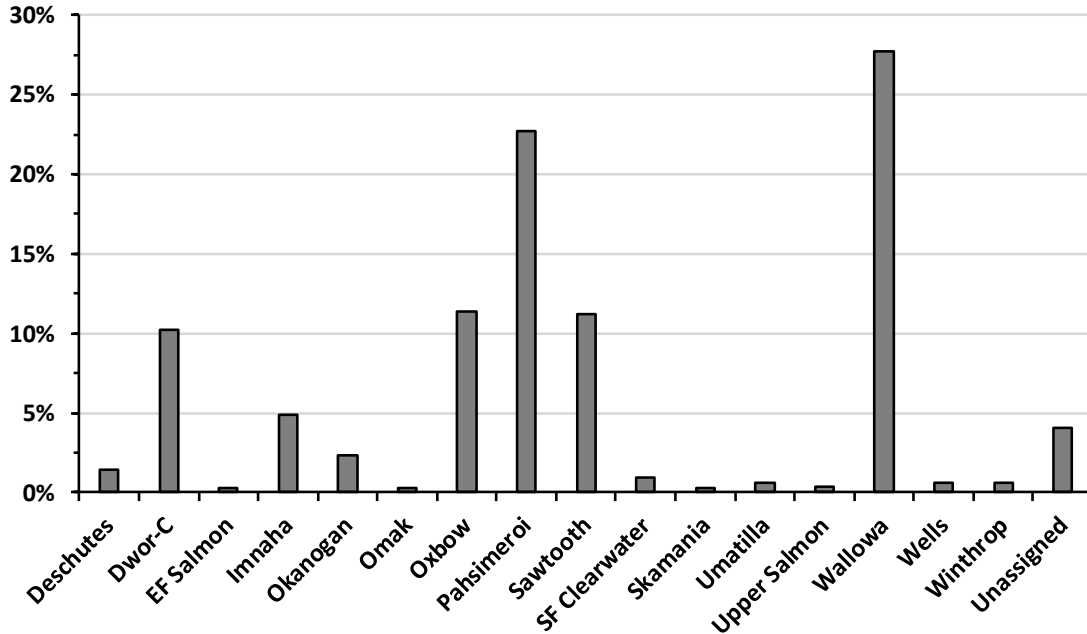


Figure 10. Hatchery stock composition of the clipped steelhead caught in the Tribal Zone 6 fall period fishery.

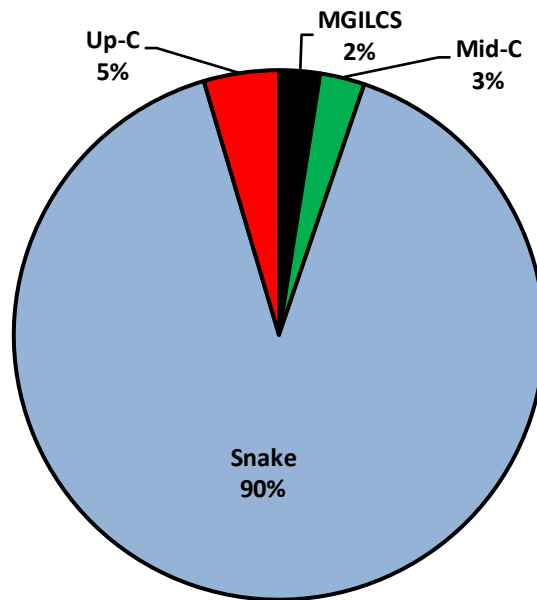


Figure 11. Harvest contribution by basin of clipped steelhead caught in the Tribal Zone 6 fall period fishery. The SKAMAN basin contributed 0.5% of the harvest (not shown in chart).

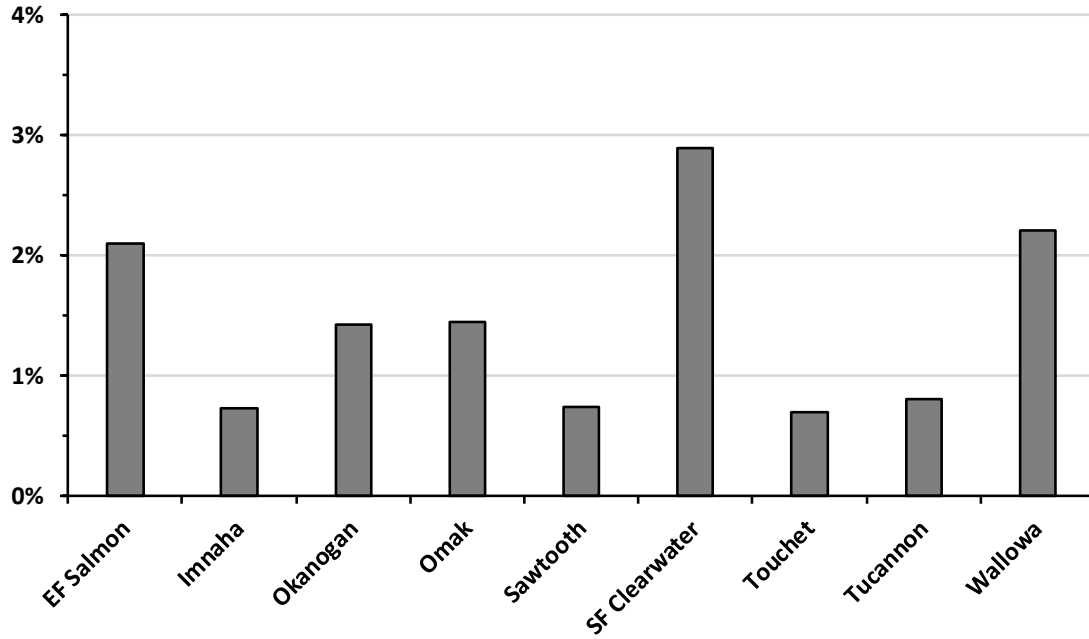


Figure 12. Hatchery stock composition of the unclipped steelhead that were identified with PBT in the Tribal Zone 6 fall period fishery. PBT assignments were made for 13% of the total unclipped fish.

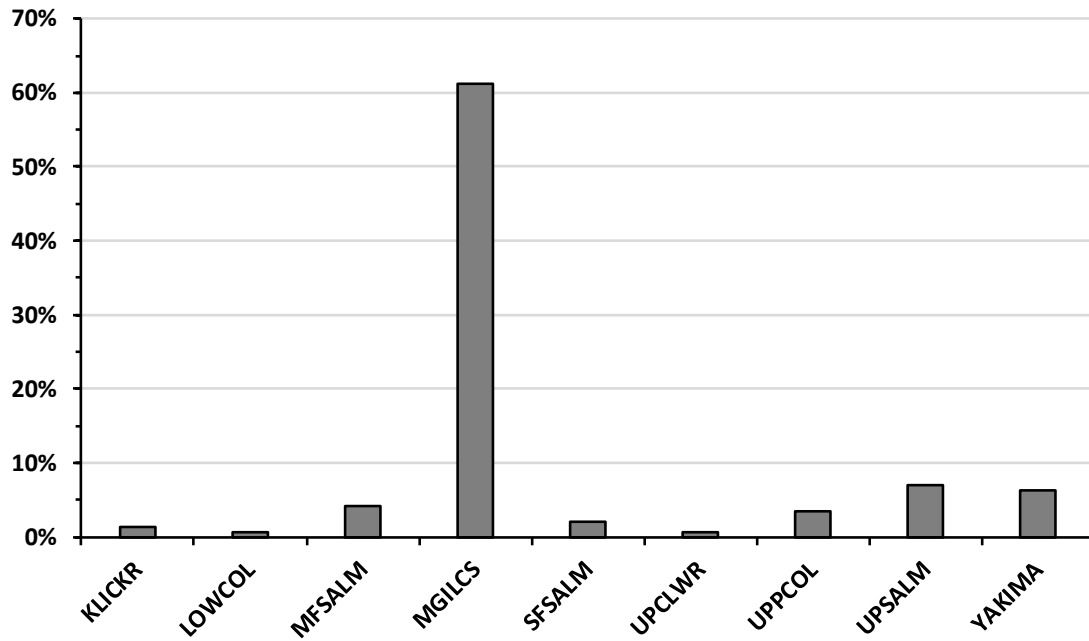


Figure 13. Stock composition of the unclipped steelhead GSI reporting groups in the Tribal Zone 6 fall period fishery. GSI assignments were made for 87% of the total unclipped fish.

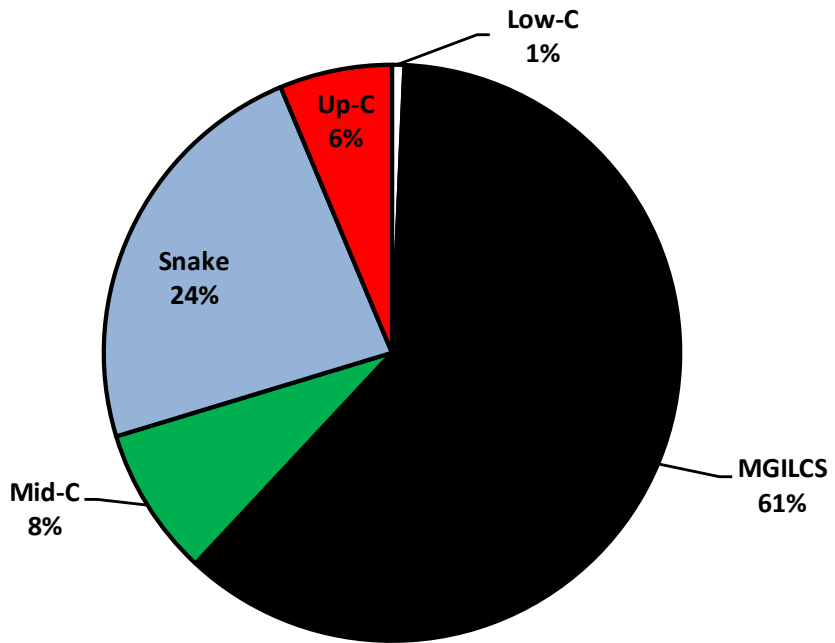


Figure 14. Contribution by basin of all unclipped steelhead caught in the Tribal Zone 6 fall period fishery.

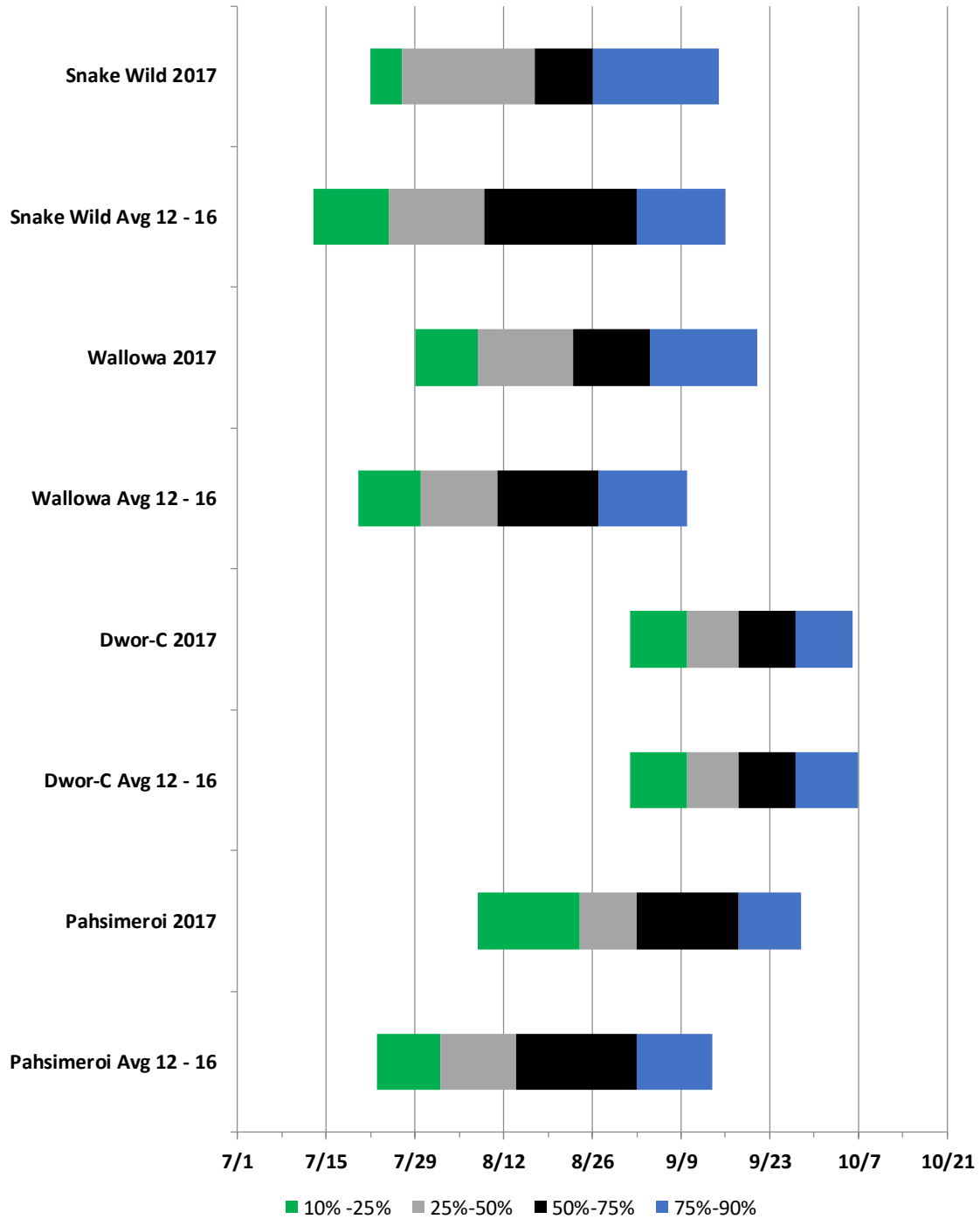
APPENDIX A

Appendix I. Arrival dates of fall Chinook and steelhead stocks at Bonneville Dam in 2017 and the percentage of the run that had passed Bonneville Dam on August 21. The fall Chinook arrival dates were calculated using adult counts from August 1 to November 30. Duration is the number of days from the minimum date to the maximum date of each arrival quantile of the Snake River hatchery stocks.

Stock	Number	Date arrival quantile attained at Bonneville Dam							% on 8/21
		5%	10%	25%	50%	75%	90%	95%	
Fall Chinook	326,023	8/23	8/28	9/6	9/12	9/19	9/30	10/8	3.7%
Dwor-C	122	8/25	9/1	9/10	9/18	9/27	10/6	10/12	3.8%
Dwor-S	15	9/20	9/23	9/25	9/29	10/5	10/15	10/19	0.0%
EF Salmon	18	7/21	7/27	7/29	8/24	9/12	9/21	9/23	38.9%
SF Clearwater	38	8/28	8/30	9/14	9/23	9/29	10/9	10/13	0.0%
Upper Salmon	15	8/2	8/28	9/18	10/1	10/14	10/20	10/21	6.7%
Oxbow	71	7/31	8/5	8/20	8/27	9/14	9/21	9/27	28.2%
Pahsimeroi	114	8/2	8/8	8/24	9/2	9/18	9/28	10/6	21.1%
Sawtooth	126	8/1	8/6	8/20	8/27	9/12	9/21	9/24	27.8%
Imnaha	164	7/20	7/25	8/3	8/19	8/25	9/9	9/12	62.2%
Wallowa	376	7/26	7/29	8/8	8/23	9/4	9/21	9/24	43.6%
Tucannon	69	7/8	7/20	7/31	8/19	8/27	9/15	10/22	59.4%
Skamania	153	4/24	5/5	5/25	6/20	7/7	7/25	8/2	96.7%
Upper-C Hatch	319	7/21	7/28	8/8	8/20	8/30	9/10	9/18	55.2%
Mid-C Hatch	135	7/20	7/22	8/6	8/22	8/29	9/17	9/23	47.4%
Mid-C Wild	257	7/11	7/17	7/25	8/3	8/20	9/13	9/21	75.9%
Snake Wild	145	7/18	7/22	7/27	8/17	8/26	9/15	9/22	58.6%
Upper-C Wild	36	7/11	7/19	8/2	8/17	8/23	9/3	9/16	66.7%
MIN Snake hatchery		7/8	7/20	7/29	8/19	8/25	9/9	9/12	
MAX Snake hatchery		9/20	9/23	9/25	10/1	10/14	10/20	10/22	
Duration (days)		74	65	58	43	50	41	40	

Appendix II. Arrival dates of hatchery and wild steelhead stocks at McNary Dam in 2017 and the percentage of the run that had passed McNary Dam on August 21. Duration is the number of days from the minimum date to the maximum date of each arrival quantile of the Snake River hatchery stocks.

Stock	Number	Date arrival quantile attained at McNary Dam							% on 8/21
		5%	10%	25%	50%	75%	90%	95%	
Dwor-C	98	9/19	9/21	9/27	10/1	10/8	10/21	10/28	1.0%
Dwor-S	14	9/29	10/2	10/3	10/7	10/15	10/22	11/1	0.0%
EF Salmon	14	7/28	9/7	9/18	9/21	9/30	10/1	3/14	7.1%
SF Clearwater	28	9/24	9/25	9/26	10/2	10/11	10/24	10/26	0.0%
Upper Salmon	15	9/8	9/25	9/25	10/10	10/21	10/26	10/28	0.0%
Oxbow	60	9/11	9/16	9/19	9/24	9/29	10/6	10/26	0.0%
Pahsimeroi	92	9/11	9/16	9/22	9/27	10/3	10/13	10/25	1.1%
Sawtooth	103	9/17	9/18	9/21	9/25	10/1	10/6	10/11	0.0%
Imnaha	125	8/17	8/31	9/12	9/19	9/27	10/8	10/27	6.4%
Wallowa	306	9/8	9/13	9/19	9/26	10/2	10/17	10/24	2.6%
Tucannon	44	7/16	8/24	9/19	9/30	10/14	10/31	11/28	9.1%
Upper-C Hatch	239	7/26	8/19	9/1	9/11	9/20	9/26	10/1	11.3%
Snake Wild	176	7/27	8/29	9/17	9/23	10/5	10/20	10/26	9.1%
Upper-C Wild	27	7/17	8/10	9/2	9/17	9/28	10/3	10/21	14.8%
MIN Snake hatchery		7/16	8/24	9/12	9/19	9/27	10/1	10/11	
MAX Snake hatchery		9/29	10/2	10/3	10/10	10/21	10/31	3/14	
Duration (days)		75	39	21	21	24	30	154	



Appendix III. Run timing of Pahsimeroi, Wallowa, and Dwor-C hatchery stocks and Snake River wild stocks at Bonneville Dam in 2017 compared with their average run timing from 2012 to 2016.

Prepared by:

Alan Byrne
Idaho Department of Fish and Game
600 South Walnut St
Boise, Idaho 83707

Joe Hymer
Pacific States Marine Fisheries Commission
2108 Grand Blvd.
Vancouver, Washington 98661

Stuart Ellis
Columbia River Inter-Tribal Fish Commission
700 NE Multnomah, Suite 1200
Portland, Oregon 97232

Roger Dick II
Yakama Nation
PO Box 51
Toppenish, Washington 98948

Ken Keller
Pacific States Marine Fisheries Commission
2108 Grand Blvd.
Vancouver, Washington 98661

Craig A. Steele
Pacific States Marine Fisheries Commission
Idaho Department of Fish and Game
1800 Trout Road
Eagle, Idaho 83616

Megan Begay
Yakama Nation
PO Box 51
Toppenish, Washington 98948

Todd Miller
Washington Department of Fish and Wildlife
401 South Cottonwood Street
Dayton, Washington 99328

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME



J. Lance Heddon
Anadromous Fishery Manager



James P. Fredericks, Chief
Bureau of Fisheries