



**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**

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ABBREVIATIONS AND ACRONYMS

BON	Bonneville Dam
BWSALM	Big White Salmon
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
LOWCOL	Lower Columbia
LCI	Lower 90% Confidence Interval
MCN	McNary Dam
MFSALM	Middle Fork Salmon
MY	Migration Year
MGILCS	Mid Columbia-Grande Ronde-Imnaha-Lower Snake-Lower Clearwater-Lower Salmon
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 Tribes
SFCLWR	South Fork Clearwater
SFSALM	South Fork Salmon
SKAMAN	Skamania
TAC	<i>U.S. v Oregon</i> Technical Advisory Committee
UCI	Upper 90% Confidence Interval
UPCLWR	Upper Clearwater
UPPCOL	Upper Columbia
UPSALM	Upper Salmon
WDFW	Washington Department of Fish and Wildlife
YN	Yakama Nation

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ABSTRACT

We used PBT and GSI to categorize the stock composition of steelhead harvested in tribal and non-tribal fisheries in the Columbia and Snake rivers. This is the second year that we have used genetic technology to parse harvest into stocks. All steelhead used for broodstock in the Snake River basin have been genotyped since BY09, allowing us to identify Snake River hatchery origin fish with PBT. Samples from unclipped adipose fin steelhead that did not assign to a Snake River hatchery stock with PBT were assigned to a reporting group using GSI. We sampled the lower Columbia River sport fishery from July 1 to October 31, 2012 and the Zone 6 tribal fishery from August 1 to November 10, 2012. In 2012, we expanded the area sampled compared to 2011 by sampling sport fisheries in Zone 6 and in the Snake River from its mouth upstream to Lower Granite Dam. The Snake River downstream of Lower Granite Dam was sampled from September 1, 2012 to March 31, 2013. We found that the majority of steelhead sampled came from the Snake River basin in all fisheries. Snake River basin hatchery stocks made up 70% of the lower Columbia sport catch, 85% of the clipped harvest in the tribal Zone 6 fishery, 25% of the unclipped tribal Zone 6 catch, and over 99% of the Snake River catch. Although harvest estimates were unavailable for the sport fisheries we sampled in Zone 6, we estimated that the Snake River basin stock composition was 73% in Washington shore area, 95% in the mouth of the Deschutes River area, and 100% in the John Day Arm.

INTRODUCTION

Steelhead are present in the Columbia River the entire year and populations contributing to returns are managed based on run timing as outlined in the *U.S. v Oregon* Management Agreement from the mouth to McNary Dam. All steelhead handled in fisheries downstream of Bonneville Dam from November 1 through April 30 are managed as winter steelhead. The steelhead populations of concern in this report are summer run fish. The Columbia River summer steelhead run includes populations from tributaries upstream and downstream of Bonneville Dam. The majority of the summer steelhead enter the river from May through October. All steelhead handled in fisheries downstream of Bonneville Dam from May 1 to June 30 are managed as summer run Skamania stock steelhead. Steelhead that pass Bonneville Dam between April 1 and June 30 are counted as summer run Skamania stock steelhead. The Skamania hatchery summer steelhead stock are released in the lower Columbia tributaries, including the Willamette basin and in some tributaries within the Bonneville pool. Wild lower river summer steelhead are present in the Kalama, Lewis, Washougal, and Wind rivers in Washington, and in the Hood River in Oregon. The lower Columbia River steelhead DPS was listed as threatened by the NMFS in May 1999. The recent five year average return (2007 – 2011) of Skamania steelhead at Bonneville Dam was 13,747 total fish of which 4,583 were wild origin (JSR 2012).

All steelhead handled in fisheries downstream of Bonneville Dam from July 1 to October 31 are managed as summer run upriver-stock steelhead. Summer run upriver steelhead passing Bonneville Dam between July 1 and October 31 are defined to be either Group A or Group B based on fork length. Group A steelhead are destined for tributaries throughout the Columbia basin and are defined as fish <78 cm fork length. Group B steelhead are primarily bound for the rivers in Idaho and are defined as fish ≥78 cm fork length. The NMFS has divided the upriver wild summer steelhead run into three DPSs: 1) the middle Columbia DPS which includes steelhead destined for Columbia River tributaries from upstream of the Wind and Hood rivers upstream to and including the Yakima River (listed as threatened in May 1999), 2) the upper Columbia DPS which includes steelhead destined for Columbia River tributaries upstream of the Yakima River (listed as endangered in May 1999 and then changed to threatened in June 2009), and 3) the Snake River DPS which includes steelhead returning to the Snake River basin (listed as threatened in October 1997). The recent five-year average return (2007 – 2011) of Group A steelhead at Bonneville Dam was 333,998 total fish of which 106,958 were wild origin and 68,637 total Group B of which 14,481 were wild origin (JSR 2012). In the past there was no reliable method available to segregate the steelhead run at Bonneville Dam into individual DPSs.

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-tribal 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-tribal 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.

Steelhead harvest is estimated for all tribal and non-tribal fisheries. In sport fisheries, steelhead harvest is estimated monthly downstream of Bonneville Dam in the lower Columbia River. Sport catch upstream of Bonneville Dam is estimated from catch 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 the *U.S. v. Oregon* Management Agreement. Final harvest estimates are reported by *U.S. v. Oregon* Technical Advisory Committee (TAC) at the conclusion of the tribal fishery. Tribal steelhead harvest estimates are reported as the number of clipped and unclipped fish kept that were <78 cm (Group A) and ≥78 cm (Group B). Although there is some sampling for CWT, the low number of CWT recovered in Columbia River fisheries did not allow a precise or accurate analysis of the stock composition of the steelhead harvest in the sport or tribal fisheries (Tables 1 and 2). In addition, not all steelhead stocks are marked with CWT.

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. The lack of an adequate number of CWT recoveries does not allow an assessment of the contribution of Idaho stocks in downriver fisheries. To address this problem, the Idaho Department of Fish and Game (IDFG) began sampling hatchery steelhead used for broodstock starting with Brood Year (BY) 2008 at all hatcheries in Idaho (Steele et al. 2011). Beginning with BY09 and continuing each year afterward, all hatchery steelhead used for broodstock in the Snake River basin have been sampled by IDFG, Washington Department of Fish and Wildlife (WDFW), and Oregon Department of Fish and Wildlife (ODFW). All samples were genotyped allowing managers to identify the origin and age of all offspring using Parental Based Tagging (PBT) methods. IDFG initiated this study in 2011 because (1) there were no existing plans to use genetic data to estimate the Snake River hatchery contribution of steelhead harvest; (2) evaluation of IDFG steelhead hatchery programs requires more precise estimates of harvest contributions from specific release sites in downriver fisheries than are possible using CWTs, and (3) the majority of summer steelhead smolts that are released in the Columbia River basin are from Snake River basin hatcheries (Table 3). In 2012, IDFG coordinated the sampling of steelhead harvested in the lower Columbia River sport fishery downstream of Bonneville Dam (Figure 1) from July 1 to October 31 and the tribal Zone 6 fishery from Bonneville Dam to McNary Dam from early August until November (Figure 2). Samples were also obtained from steelhead kept by sport anglers upstream of Bonneville Dam in the Bonneville pool, Drano Lake, near the mouth of the Deschutes River, and in the John Day Arm. WDFW sampled steelhead from September 1, 2012 to March 31, 2013 that were caught in the sport fishery in the Snake River from the mouth to Lower Granite Dam. The primary cooperators in this effort were IDFG, Columbia River Inter-Tribal Fish Commission (CRITFC), WDFW, Yakama Nation (YN), Pacific States Marine Fish Commission (PSMFC), and ODFW.

All adipose clipped fish are known to be hatchery origin. Clipped hatchery fish from the Snake River basin could be assigned to a hatchery stock and release group using PBT markers. Clipped steelhead that do not assign using PBT markers are either a hatchery fish from outside the Snake River basin or a Snake River hatchery fish from a hatchery and BY that was not sampled. 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 of Snake River basin hatchery origin. Unclipped samples that did not assign to a Snake River hatchery basin release group (putative wild fish) were assigned to a Columbia River reporting group developed by CRITFC using Genetic Stock Identification (GSI) markers (Hess et al. 2013) These reporting groups may contain wild origin or unclipped hatchery origin steelhead.

The objectives of this study are to use the steelhead harvest estimates that the *U.S. v. Oregon Technical Advisory Committee* (TAC), ODFW, and WDFW publishes for main-stem

sport and tribal fisheries in the Columbia River downstream of McNary Dam, the Snake River sport fishery downstream of Lower Granite Dam, and the results of the genetic analysis of collected samples to:

1. Estimate the contribution by the Snake River basin and each Snake River hatchery release group to sport harvest from the Columbia River downstream of Bonneville Dam (Sections 1 – 10) and the Snake River downstream of Lower Granite Dam (Sections 640, 642, 644, and 646).
2. Estimate the contribution by the Snake River basin and each Snake River hatchery release group in the sport harvest upstream of Bonneville Dam in the sampled areas.
3. Estimate the percent of the unclipped hatchery origin and wild origin steelhead caught in the Zone 6 tribal fishery.
4. Estimate the Snake River basin wild and hatchery contribution in the Zone 6 tribal harvest.
5. Estimate the contribution of each Snake River hatchery release group (clipped and unclipped) in the Zone 6 tribal harvest.
6. Assign putative wild steelhead into reporting groups using GSI and estimate the percentage of harvest from each reporting group in the Zone 6 tribal harvest.

IDFG coordinated the sampling of the lower Columbia River sport fishery and tribal Zone 6 fishery from August through October in 2011. We found that most of the steelhead harvested in these fisheries were from the Snake River basin. In 2011, we assigned 78% of the July to October lower Columbia River sport harvest to Snake River hatchery stocks. We assigned 96% of the clipped harvest and 55% of the unclipped harvest in the tribal Zone 6 fall 2011 fishery to steelhead stocks from the Snake River (Byrne et al. 2014).

This is the second year that we have estimated the stock contribution to sport and tribal harvest in the Columbia River. In 2012, we sampled the lower Columbia River sport fishery from July 1 to October 31 and the tribal Zone 6 fishery from August 1 to November 10. We expanded the areas we sampled in 2012. ODFW and WDFW collected samples from sport anglers upstream of Bonneville Dam in the Bonneville pool, Drano Lake, in the Columbia River near the mouth of the Deschutes River, and in the John Day Arm. The YN sampled a tribal fishery held in Drano Lake in October. WDFW collected samples from sport anglers in the Snake River from its mouth upstream to Lower Granite Dam from September 1, 2102 to March 31, 2103.

METHODS

Steelhead passage at Bonneville and McNary dams

The daily count of clipped and unclipped steelhead at Bonneville Dam and McNary Dam from July 1 to October 31, 2012 was obtained from the Army Corp of Engineers website (available at <http://www.nwp.usace.army.mil/Missions/Environment/Fish/Data.aspx>). 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 ageing 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). TAC used this data to estimate the percentage of unclipped fish that were Group A and Group B wild and hatchery fish and clipped fish that were Group A hatchery or Group B hatchery fish that passed the dam weekly between July 1 and October 14. For the October 15 to October 31 period, TAC used the average percentages from the previous two weeks. These percentages were multiplied by the unclipped and clipped steelhead dam count in each time period to estimate the number of wild and hatchery origin Group A and Group B fish that passed the dam. The total Group A and Group B wild and 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 (detection data obtained from <http://www.ptagis.org>) from June 1, 2012 to December 31, 2012. Very few summer steelhead (from Spawn Year 2013) were detected at Bonneville Dam prior to June 1. Only 1.3%, 0.8%, and 0.3% of all hatchery origin summer steelhead detections from the mid-Columbia (with Skamania hatchery fish omitted), upper-Columbia, and Snake regions, respectively, occurred in April and May. There were no wild summer steelhead detections from Spawn Year 2013 at Bonneville Dam before June 1, 2012. We only used adult detection data of fish that were tagged as juveniles. We estimated the cumulative passage proportion for each date at the two dams. The run timing of each Snake River hatchery stock was calculated by combining detections from all of the stock's release groups and BYs. 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.

Lower Columbia River Sport harvest estimates

Sport anglers could retain two adult salmon or hatchery steelhead per day or one of each species in the Columbia River from Buoy 10 to Bonneville Dam. Only steelhead with a clipped adipose fin may be kept. Sport fisheries 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 October 31. The recreational sport fishery downstream of Bonneville Dam is divided into ten sampling sections. 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. Total number of fish caught and released for each species, month, and strata is estimated by combining total angler effort estimates derived from aerial surveys with the observed angler catch rates in each strata (Watts 2013; TAC 2008). The hatchery stock composition of the harvest is not reported.

Tribal Zone 6 harvest estimates

There were 22.5 days open for commercial set net fishing during a seven-week period from August 21 to October 4, 2012 that primarily target fall Chinook salmon. The dates of the commercial seasons were:

6 AM Tuesday August 21 to 6 PM Thursday August 23 (2.5 days)
6 AM Monday August 27 to 6 PM Thursday August 30 (3.5 days)
6 AM Tuesday September 4 to 6 PM Saturday September 8 (4.5 days)
6 AM Tuesday September 11 to 6 PM Friday September 14 (3.5 days)
6 AM Tuesday September 18 to 6 PM Friday September 21 (3.5 days)
6 AM Wednesday September 26 to 6 PM Friday September 28 (2.5 days)
6 AM Tuesday October 2 to 6 PM Thursday October 4 (2.5 days)

These fisheries also catch significant numbers of steelhead as both species are abundant in Zone 6 during the time period the commercial seasons are open (Figure 3). In addition to the commercial seasons, platform and hook and line fisheries were open from August 1 to November 10, 2012.

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 the *U.S. v. Oregon* Management Agreement. There is no specific harvest rate limit on A-run steelhead for the season and B-run steelhead in the month of July. In 2012, the total B-run steelhead allowable harvest rate in the treaty fishery after August 1 was 15% (4,158 B-run fish).

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 are fishing. Steelhead are measured and classified as Group A (<78 cm) or Group B (≥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, 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 TAC 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 are reviewed and then reported by TAC. Steelhead harvest is reported for clipped and unclipped Group A and Group B fish (JSR 2013; TAC 2008).

Lower Snake River harvest estimates

Sport anglers could retain three hatchery steelhead per day in the Snake River from its mouth to the Washington/Idaho border. Only steelhead with a clipped adipose fin could be kept. The recreational sport fishery downstream of the Washington/Idaho border is divided into five sampling sections (Figure 4). We estimated harvest from the mouth of the Snake River to Lower Granite Dam (Sections 640, 642, 644, and 646). Monthly harvest estimates were made for each section from catch cards. Harvest estimates are available from the WDFW website (available at <http://wdfw.wa.gov/fishing/harvest>)

Sample collection from 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 CWT, PIT tag, measured the fork length, and recorded the river section and date the fish was caught. The first samples were obtained on July 1 and the last sample was collected on October 23, 2012. A total of 1,806 samples were collected from the sport fishery (Table 4). Crews collected 1,127 samples in July, 646 samples in August, and 33 samples after September 1, 2012.

We estimated stock composition for the entire period from July 1 to October 31, 2012. We drew a random subsample of 838 from the 1,806 samples we collected for genotyping. We allocated the subsample in proportion to the monthly harvest estimates. Ideally, we would have chosen 542 samples from July, 251 samples from August, 34 from September, and 11 from October. However, we only collected 23 samples in September. After we chose the 251 August samples, we then chose an additional 10 samples from the last 10 days of August to represent fish caught in September. The final sample used for the analysis included 535 fish from July, 251 fish from August, 23 from September, and 10 from October. Ten of the 838 samples were omitted from the analysis because they failed to meet the criteria used to make assignments or were determined to be a duplicate sample from the same fish. The final sample size used to estimate harvest contribution was 828 (Table 4).

Sample collection from tribal Zone 6 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 CWT, 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 August 22 and the last sample collected on October 11, 2012. A total of 703 samples from clipped steelhead and 451 samples from unclipped steelhead were collected (Table 5 and 6). No samples were obtained from the platform fishery from August 1 to August 20.

The harvest contribution by release group for clipped steelhead was estimated for two time periods: (1) August 1 to August 20 and (2) August 21 to November 10. Harvest contribution for the August 1 to August 20 period was estimated using all samples collected from August 22 to August 30 ($n = 93$). We assumed that the stock composition from samples obtained from August 22 to August 30 was representative of the stock composition in the harvest from August 1 to August 20. We estimated the clipped stock composition from August 21 to November 10 using samples that were collected in that time period. We drew a random subsample of 627 from the 703 clipped steelhead samples we collected to estimate the stock composition from August 21 to November 10. Thirty samples were omitted from the analysis because they failed to meet the criteria used to make assignments or were determined to be duplicate samples from the same fish. The final sample size used to make estimates of the clipped harvest contribution in the time period from August 21 to November 10, 2012 was 597 (Table 5).

The harvest contribution by release and reporting groups for unclipped steelhead was estimated for two time periods: (1) August 1 to August 20 and (2) August 21 to November 10. Harvest contribution for the August 1 to August 20 period was estimated using all samples

collected from August 22 to August 30 ($n = 73$). We assumed that the stock composition from samples obtained from August 22 to August 30 was representative of the stock composition in the harvest from August 1 to August 20. We estimated the unclipped stock composition from August 21 to November 10 using samples that were collected in that time period. We genotyped all 451 samples from the unclipped fish that were collected between August 22 and November 10; however, 40 samples were omitted from the analysis because they failed to meet the criteria used to make assignments or were determined to be a duplicate sample from the same fish. In addition, eight samples that successfully genotyped were omitted from the analysis because the presence or absence of the adipose fin was not recorded. The final sample size used to make estimates of the unclipped harvest contribution from August 21 to November 10 was 403 (Table 6).

Sample collection from tribal Drano Lake fishery

Yakama Nations crews sampled the tribal late fall commercial fishery held in Drano Lake on October 9, 16, 23, and 30. In addition to a tissue sample, crews also checked the fish for a CWT, 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. A total of 104 samples were collected during the four days of fishing in Drano Lake. Forty-one samples were obtained from clipped fish, 60 from unclipped fish, and three from fish that did not have the presence or absence of the adipose fin recorded. All 41 samples from clipped fish were successfully genotyped and used in the analysis. All 60 samples from unclipped fish were genotyped; however, one was excluded from the analysis because it failed to meet the criteria used to make assignments.

Sample collection from Columbia River Zone 6 sport fishery

WDFW sampled anglers between Bonneville Dam and The Dalles Dam on the Washington shore between July 19 and October 5, 2012. ODFW sampled anglers that fished in the Columbia River near the mouth of the Deschutes River from August 25 to October 27, 2012. ODFW also sampled anglers that fished in the John Day Arm and the Columbia River within 5 kilometers of the mouth of the John Day River after October 1, 2012. In addition to a tissue sample, crews measured the fork length and recorded the location and date the fish was caught. Sampling of sport anglers in Zone 6 was of an opportunistic nature and did not occur in the entire section(s) of the Columbia River that are used to report harvest. WDFW collected a total of 88 samples from the Washington shore. Crews collected samples from Drano Lake ($n = 56$), and in the Columbia River from the Bonneville Pool ($n = 23$), near the Little White Salmon River ($n = 4$), and near the Wind River ($n = 5$). ODFW crews collected 70 samples in the Columbia River near the mouth of the Deschutes River and 123 from the John Day Arm fisheries (Table 7). We did not have harvest estimates for the specific fisheries we sampled; hence we only report the stock composition. All samples that were collected were successfully genotyped and used in the analysis.

Sample collection from lower Snake River sport fishery

WDFW creel crews sampled fish caught by sport anglers in the Snake River downstream of Lower Granite 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 CWT, PIT tag, measured the fork length, and recorded the river section and date the fish was caught. The first fish was sampled on September 16, 2012 and the last fish was sampled on March 24, 2013. A total of 930 samples were obtained. Sixty-five percent of the

harvest occurred and 70% of the samples were collected from September 1 to October 31, 2012 (Table 8).

We estimated the stock composition from the mouth of the Snake River to Lower Granite Dam for the entire period from September 1, 2012 to March 31, 2013. We drew a random subsample of 634 from the 930 samples we collected for genotyping. We allocated the subsample in proportion to the monthly harvest estimates in each section as closely as possible. However, not enough samples were collected in section 646 so we used samples collected in sections 642 and 644. In all months except September and December, the monthly percentage of samples analyzed was within $\pm 3\%$ of the monthly harvest estimate (Table 8).

Estimating stock proportions and harvest contribution for clipped steelhead

Clipped steelhead samples were analyzed using the PBT panel as described in Steele et al. 2013. Fish were assigned to a release group and BY (Table 9). Samples that were not assigned by PBT screening to a Snake River hatchery release group were put in the Other group. The Other reporting group contains fish from release groups in Snake River hatcheries whose parents were not genotyped and fish from non-Snake River hatcheries. In 2012 the only returning adults from Snake River hatchery stocks and BYs that were not genotyped were 3-ocean adults (BY08) from Lyons Ferry, Wallowa, Touchet, and Tucannon stocks. However, nearly all adult returns from these stocks spend one or two years in the ocean. The number of samples that were assigned to a release group and BY were expanded using the release group and BY mark rate as:

$$Cpe_{jtib} = C_{jtib} / m_{ib} \quad (1)$$

Where:

j = fishery (1 = sport, 2 = tribal)

t = sample stratum

i = number of release groups (19)

b = Brood Year (1=BY2008, 2=BY2009, and 3=BY2010)

C_{jtib} = number of clipped fish sampled from fishery (j) and stratum (t) that assigned to release group (i) and Brood Year (b)

m_{ib} = the PBT mark rate for release group (i) in Brood year (b).

The expanded count represents the expected number of fish in the sample from each group if all groups had a tag rate = 1. The total of expanded samples from clipped fish in fishery j and stratum (t) that originate from all release groups i and all brood years b was:

$$Cpe_{jt} = \sum_{b=1}^3 \sum_{i=1}^{19} Cpe_{jtib} \quad (2)$$

The number of clipped fish sampled from fishery (j) and stratum (t) that did not assign to a release group was:

$$Cn_{jt} = Fc_{jt} - Cpe_{jt} \quad (3)$$

Where:

Fc_{jt} = the number of clipped samples that were genotyped from fishery (j) and stratum (t) and used for the PBT analysis.

The proportion of the sampled clipped fish from fishery (j) and stratum (t) from release group (i) and brood year (b) was:

$$qc_{jtib} = \frac{Cpe_{jtib}}{Fc_{jt}} \quad (4)$$

The proportion of clipped fish sampled from fishery (j) and stratum (t) in the Other group is:

$$qu_{jt} = \frac{Cn_{jt}}{Fc_{jt}} \quad (5)$$

The number of harvested clipped fish by hatchery release group (i) and BY (b) in fishery (j) and stratum (t) was:

$$Hc_{jtib} = Hc_{jt} * qc_{jtib} \quad (6)$$

Where:

Hc_{jt} = total harvest of clipped fish from stratum (t) in fishery (j)

The total harvest of clipped fish from release group (i) and BY (b) in fishery (j) was estimated by summing all strata:

$$Hc_{jib} = \sum_{t=1}^2 Hc_{jtib} \quad (7)$$

The number of harvested clipped fish in fishery (j) and stratum (t) from the Other group was:

$$Hu_{jt} = Hc_{jt} * qu_{jt} \quad (8)$$

The total harvest of clipped fish in fishery (j) from the Other group was:

$$Hu_j = \sum_{t=1}^2 Hu_{jt} \quad (9)$$

The percent of large fish (≥ 78 cm fork length) in the harvest was calculated using only those samples with a length measurement in the lower Columbia River sport, tribal Zone 6, and lower Snake River sport fisheries. We calculated the percent of large fish ≥ 78 cm within each

Snake River release group (L_i) identified with PBT by dividing by the sum of fish ≥ 78 cm in each BY by the sum of all fish sampled for length in each BYs.

$$L_i = \sum_{b=1}^3 l_{ib} / \sum_{b=1}^3 n_{ib} \quad (10)$$

where l_{ib} = number of fish ≥ 78 cm in release group i , brood year b and
 n_{ib} = number of fish sampled for length in release group i , brood year b .

To calculate the percent of the total large fish from each release group (T_i) we: (1) expanded the number of fish sampled for length in each release group by the appropriate PBT mark rate,

$$Expand_i = \sum_{b=1}^3 n_{ib} / m_{ib} \quad (11)$$

where m_{ib} = PBT tag rate for release group i , brood year b .

(2) calculated the expected number of large fish in each release group ($Expect_i$) by multiplying the expanded total by the within release group large percent (from Equation 10),

$$Expect_i = Expand_i * L_i \quad (12)$$

and (3) divided the expected number of large fish by the total sample size.

$$T_i = Expect_i / N_t \quad (13)$$

where N_t total number of fish sampled for length.

The within percent large of the Other group (O_i) was the total number of large fish sampled minus the expected number of large fish from all release groups divided by the total sample size minus the sum of the expanded sample size of all release groups.

$$O_i = \left(N_t - \sum_{i=1}^{19} Expect_i \right) / \left(N_t - \sum_{i=1}^{19} Expand_i \right) \quad (14)$$

where N_t total number of large fish sampled.

The percentage of the total large fish from the Other group (O_t) was:

$$O_t = \left(N_t - \sum_{i=1}^{19} Expect_i \right) / N_t \quad (15)$$

Sex ratios were calculated for the Snake River release groups identified with PBT using the results of a genetic sex marker that was run on each sample during genotyping (Campbell et al. 2012).

Confidence Intervals for clipped sample percentages

Confidence intervals for the clipped stock composition estimates in each stratum(t) were generated using the script *Rsampit.r* (M. Ackerman, IDFG Eagle Fish Genetics Lab) performed in the R programming environment (R Development Core Team 2009). *Rsampit.r* resampled (bootstrapped) with replacement s number of times where $s = 1$ to $F_{c_{jt}}$ (number of samples in fishery j and stratum t) from the actual data series of 'stock/brood year' assignments and unassigned fish. Within each iteration (s) the pool of samples with known release group (i) and brood year (b) assignments were expanded to Cpe_{jti} (Equation 1) and the sum of the expanded estimates Cpe_{jt} (Equation 2) were subtracted from the sample size $F_{c_{jt}}$ and to estimate the number of fish that were not assigned Cn_{jt} (Equation 3). The expanded release group/BY assignments and estimated number of unassigned fish were divided by the sample size ($F_{c_{jt}}$) to estimate their respective proportions qc_{ji} and qu_{ji} in the sample (Equations 4 and 5). These proportions were multiplied by the total harvest to estimate harvest contribution of each group (Equations 6 and 8). We performed 10,000 iterations and sorted the values in ascending order. The $100(1-\alpha)\%$ confidence intervals in each stratum for the proportions and harvest estimates were the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ values of the ordered bootstrap values. The harvest CIs for a fishery with more than one stratum was found by adding the harvest estimates of each stratum for each bootstrap iteration and choosing the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ ordered values.

We calculated the confidence interval for the total Snake River basin hatchery contribution in the lower Columbia River sport fishery, the sport Zone 6 fisheries, the tribal Zone 6 clipped fishery from August 1 to August 20, the tribal Zone 6 clipped fishery from August 21 to November 10, and the tribal Drano Lake fishery by summing the proportions of all Snake River release groups and BYs for each bootstrap iteration. We calculated the confidence interval for the total Snake River basin hatchery contribution in the Zone 6 tribal clipped fishery from August 1 to November 10 by summing the harvest of all Snake River release groups and BYs in both time periods for each bootstrap iteration and dividing by the total clipped harvest. The $100(1-\alpha)\%$ confidence intervals were the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ values of the ordered bootstrap values.

We calculated the confidence interval for the total Snake River basin hatchery contribution in the sport Zone 6 fisheries in the Washington shore, mouth of Deschutes River, and John Day Arm using the relationship between the F distribution and the binomial distribution as described in Zar (1984).

Estimating stock proportions and harvest contribution for unclipped steelhead

Unclipped steelhead that were harvested were composed of unclipped hatchery fish and wild fish. The unclipped samples were analyzed using the GSI and PBT panels (Ackerman et al. 2012, Hess et al. 2013, Steele et al. 2013). The GSI panel was used to assign all fish to a GSI reporting group (Figure 5) developed by CRITFC as described in Hess et al 2013. The PBT panel was used to assign unclipped hatchery origin steelhead to release groups and Brood Year (Table 9). Unclipped fish that were identified with the PBT panel were placed in the same release group (i) and Brood Year (b) categories as those used for clipped fish. Unclipped fish that did not assign to a hatchery group using the PBT panel were assigned to a GSI reporting group (k) using the best (most likely) assignment regardless of its probability.

Uncropped steelhead were only harvested in the tribal Zone 6 fishery. The number of uncropped samples used in the analysis (Fu_t) was:

$$Fu_t = U_{tib} + G_{tk} \quad (16)$$

Where:

t = sample stratum

U_{ib} = number of samples assigning to hatchery release group i and Brood Year b in stratum t .

G_k = number of samples that did not assign using the PBT panel and were assigned to a GSI report group (k) in stratum t using the GSI panel.

The number of known hatchery origin samples in stratum t was expanded by the PBT mark rate:

$$Ue_{tib} = U_{tib} / m_{ib} \quad (17)$$

Where:

m_{ib} = PBT mark rate of hatchery release group i and Brood Year b .

The proportion of samples in hatchery release group i and Brood Year b in stratum t was:

$$qh_{tib} = Ue_{tib} / Fu_t \quad (18)$$

The number of fish harvested from release group i and Brood Year b in stratum t was:

$$Hh_{tib} = qh_{tib} * Hu_t \quad (19)$$

Where:

Hu_t = total uncropped harvest in stratum t .

Since fish were added to hatchery release groups after expanding for the mark rate, an equal number of fish must be subtracted from the GSI reporting groups. The subtraction to adjust the GSI reporting group counts was done as:

The difference between the expanded and actual count of hatchery release group i and Brood Year b in stratum t was:

$$D_{tib} = Ue_{tib} - U_{tib} \quad (20)$$

The difference between the expanded and actual count in stratum t for each reporting group i was:

$$D_{ti} = D_{ti1} + D_{ti2} + D_{ti3} \quad (21)$$

Where:

1, 2, and 3 are Brood Year 2008, 2009, and 2010.

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

$$n_{tk} = \sum_{i=1}^{20} p_{ik} * D_{ti} \quad (22)$$

Where:

p_{ik} = proportion of hatchery release group i that assign to GSI reporting group k (see Table 10). Each p_{ik} represents the percentage of hatchery release group i that would assign to GSI reporting group k if PBT was not used. Release groups that were combined to increase sample size were (a) Upper Salmon and EF_Salmon; (b) LF_Tucannon, Imnaha, and Lyons Ferry; and (c) Sawtooth and SBT_Sawtooth.

The adjusted number of samples in GSI reporting group k in stratum t was:

$$A_{tk} = G_{tk} - n_{tk} \quad (23)$$

The proportion of samples in GSI reporting group k in stratum t was:

$$qg_{tk} = A_{tk} / Fu_t \quad (24)$$

The number of fish harvested from GSI reporting group k in stratum t was:

$$Hg_{tk} = qg_{tk} * Hu_t \quad (25)$$

The total harvest from hatchery release group i and Brood year b was:

$$\sum_{t=1}^2 Hh_{tib} \quad (26)$$

The total harvest of GSI reporting group k was:

$$\sum_{t=1}^2 Hg_{tk} \quad (27)$$

Sex ratios were calculated 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 using the samples that were measured for length. We estimated the sex ratio and percent of fish ≥ 78 cm of the unclipped fish in each release and reporting group. For the release groups (hatchery origin fish) we used the actual count of each group that were identified with PBT. For the reporting groups, we used the actual count using the best GSI assignment for those fish that were not identified with PBT.

Confidence Intervals for unclipped sample percentages

Confidence intervals for the unclipped stock composition estimates were generated using the script *bootstock.r* (M. Ackerman, IDFG Eagle Fish Genetics Lab) performed in the R programming environment (R Development Core Team 2009). *Bootstock.r* resamples (bootstraps) with replacement from an original sample or set of data. The original stock assignments were resampled with replacement s number of times where $s = 1$ to F_u (the number of unclipped samples). Within each iteration, we then calculated the expanded Hatchery release group/Brood year (qh_{ib}) and adjusted GSI reporting group assignment (qn_k) proportions and harvest contribution (Hh_{ib} and Hn_k) as outlined in equations 11 through 19. We performed 10,000 iterations and sorted the values in ascending order. The 100(1- α)% confidence intervals for the proportions and harvest estimates in each stratum were the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ values of the ordered bootstrap values. The total harvest CIs was found by adding the harvest estimates of each stratum for each bootstrap iteration and choosing the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ ordered values.

We calculated the confidence interval for the total Snake River basin hatchery contribution in the tribal Zone 6 fishery from August 1 to August 20, tribal Zone 6 fishery from August 21 to November 10, and tribal Drano Lake fishery by summing the proportions of all Snake River release groups and BYs for each bootstrap iteration. We calculated the confidence interval for the total Snake River basin hatchery contribution in the Zone 6 tribal fishery from August 1 to November 10 by summing the harvest of all Snake River release groups and BYs in both time periods for each bootstrap iteration and dividing by the total clipped harvest. The 100(1- α)% confidence intervals were the $(10,000 * \alpha/2)$ and $(10,000 * (1 - \alpha/2))$ values of the ordered bootstrap values.

RESULTS

Steelhead passage at Bonneville and McNary dams

During the period from July 1 to October 31, 2012 a total of 219,857 and 143,254 steelhead were counted at Bonneville and McNary dams, respectively (Figure 3). At Bonneville Dam, 139,441 of the total count were clipped fish. The 80,416 unclipped fish were a mixture of wild origin and unclipped hatchery origin fish. TAC, using sampling data obtained at Bonneville Dam by CRITFC, estimated that there were 192,134 Group A steelhead of which 55,464 were wild. TAC estimated that the total Group B run was 27,723 of which 6,813 were wild fish (Table 11).

Steelhead Run-timing at Bonneville and McNary dams

The earliest arriving stock at Bonneville Dam was the Skamania stock released in the Klickitat River followed by the Lyons Ferry stock. The 50% arrival date at Bonneville Dam was July 3 and July 30 for the Skamania and Lyons Ferry stocks, respectfully. All stocks except Dworshak, EF Salmon, and Upper Salmon attained their 50% arrival date at Bonneville Dam by mid-August. The Dworshak stock was the latest to arrive at Bonneville Dam and did not attain its 50% arrival date until September 19 (Figure 6). The 50% arrival date for the Upper Columbia (July 28) and mid-Columbia (July 28) wild stocks was earlier than all hatchery stocks except the Skamania stock. Snake River wild fish attained their 50% arrival date on August 9.

The earliest arriving stock at McNary Dam was Lyons Ferry followed by the Upper Columbia wild and hatchery stocks. The Upper Columbia wild and hatchery stocks had nearly identical run timing at McNary Dam. The 50% arrival date at McNary was August 5 for Lyons Ferry stock and August 12 for the Upper Columbia wild and hatchery stocks. The latest 50% arrival date was Touchet stock (October 19) and Dworshak stock (October 1). Most of the other stocks attained their 50% arrival date between September 6 and September 20 (Figure 7). The duration of the 10% - 25% and 25% - 50% quantiles was longer than observed at Bonneville Dam for all stocks except the Upper Salmon.

Lower Columbia River Sport harvest estimates

ODFW estimated that 15,923 steelhead were harvested downstream of Bonneville Dam in the Columbia River from July 1 to October 31 (Table 4). About 65% of the total harvest was caught in July and 30% was caught in August (Watts 2013). Sport anglers harvested about 4,700 less steelhead in 2012 compared to 2011 (Appendix A).

Tribal Zone 6 harvest estimates

The total tribal steelhead harvest in Zone 6 fall fishery was 9,718 clipped fish (Table 5) and 5,493 unclipped fish (Table 6). About 27% of the clipped harvest and 19% of the unclipped harvest was caught in the platform fisheries from August 1 to August 20. (JSR 2013; Roger Dick II, Yakama Nation, personal communication). Tribal fishers harvested about 12,300 less steelhead in 2012 compared to 2011 (Appendix B).

Lower Snake River Sport harvest estimates

WDFW estimated that 7,160 steelhead were harvested downstream of Lower Granite Dam in the Snake River from September 1, 2012 to March 31, 2013 (J. Bumgarner, personal communication). About 50% of the total harvest was caught in September and October. About 22% of the harvest occurred from January 1, 2013 to March 31, 2013 (Table 8).

Estimating stock proportions and harvest contribution for clipped steelhead

Lower Columbia River sport fishery

We assigned 69% (90% CI, 66% to 71.7%) of the sport harvest from July 1 to October 31 in the lower Columbia River to hatcheries in the Snake River basin. The largest contribution to the harvest from the Snake River was the Pahsimeroi, Oxbow, and Sawtooth (all groups and BYs combined) release groups. These three hatchery stocks made up 55% of the harvest (Table 12 and Figure 8). The contribution of the Dworshak release groups was estimated to be 4%. About 31% of the harvest was not assigned to Snake River hatcheries. This group is made up of hatchery origin fish from outside the Snake River basin (excluding Lyons Ferry releases in the Walla Walla basin). The largest contribution to harvest was from the Other (4,959), BY09 Oxbow (2,418), and BY10 Pahsimeroi (1,506) release groups. The harvest estimates and 90% CI for all release groups are shown in Table 13.

We were able to identify the sex of 828 fish using the genetic sex marker. We found that females made up 45.9% of the harvest. The percentage of female by release group ranged from 27.6% to 71.4% for groups with a sample size >10 (Table 14). We used 826 samples to calculate that about 10% of the harvested fish were ≥ 78 cm fork length. We found that over 32% and 39% of the large fish were from the Dworshak and Other groups, respectively.

Tribal Columbia River Zone 6 fishery

During the period from August 1 to August 20, we estimated that nearly 74% (90% CI, 65.6% to 82.1%) of the harvest was from the Snake River basin hatcheries. The Other group was the largest single contributor to the platform harvest. About 26% (681 fish) were harvested from the Other group. The Snake River basin hatcheries contributed 1,928 of the 2,609 fish that were harvested. The largest Snake River contribution came from the Oxbow (19% or 507 fish) and Wallowa (19% or 506 fish) release groups followed by Pahsimeroi (12% or 322 fish). The Dworshak release group contributed about 5% (143 fish) of the harvest in this time period (Tables 15 and 16, Figure 9).

During the period from August 21 to November 10, Snake River hatcheries contributed about 90% (90% CI, 87% to 92.1%) of the harvest (6,365 fish). Dworshak contributed about 31% of the harvest (2,179 fish), followed by Pahsimeroi (14% or 1,018 fish), and Oxbow (13% or 908 fish). The Other group contributed about 10% or 744 fish to the harvest (Table 15 and 16, Figure 10).

When harvest estimates from both time periods are combined, Snake River hatcheries contributed about 85% (90% CI, 84.2% to 90.5%) of the total harvest. The largest contributor was Dworshak (25% or 2,320 fish) with Oxbow and Pahsimeroi contributing about 15% and 14%, respectively (Table 16 and 17, Figure 11).

We estimated that 42% of the total clipped harvest were female fish. The percentage of female by release group ranged from 30.2% to 54.8% for groups with a sample size >10 (Table 13). We used all samples to calculate that about 35% of the harvested fish were ≥ 78 cm fork length. We found that over 85% of the large fish were from the Dworshak release group (Table 18).

Sport Zone 6 fishery

Snake River hatchery stocks contributed 72.7% (90% CI, 63.7% to 80.4%) of the harvest in the Washington shore sport fishery. The largest Snake River hatchery stock contribution came from Oxbow (about 26%) and Sawtooth (about 17%). We estimated that the Dworshak stock contributed about 2% of the harvest (Table 19 and Table 20, Figure 12). About 46% of the sampled fish were females and 10% were ≥ 78 cm.

Snake River hatchery stocks contributed 94.7% (90% CI, 87.9% to 98.4%) of the harvest in the mouth of the Deschutes sport fishery. The largest Snake River hatchery stock contribution came from Pahsimeroi (about 27%), Wallowa (about 21%), and Oxbow (about 18%). We estimated that the Dworshak stock contributed about 12% of the harvest (Table 19 and Table 20, Figure 13). About 48% of the sampled fish were females and 7% were ≥ 78 cm.

In the John Day Arm fishery, we assigned 118 of the 123 samples to Snake River stocks. After we expanded each release group for its tag rate, all samples collected in the John Day Arm assigned to Snake River hatcheries. The actual sample size was 123 and the sum of the expanded release group count was 123.22. We subtracted 0.22 from the Dworshak BY2009 release group so the sum of the expanded counts equaled the number of samples we collected. The Dworshak stock (38%) and Pahsimeroi stock (27%) accounted for 65% of the harvest. Sawtooth and Oxbow stocks each contributed about 13% to the harvest (Table 19 and Table 20, Figure 14). All four samples obtained in February and March of 2013 assigned to Snake

River stocks (three Dworshak and one Wallowa). About 44% of the fish were females and 29% were ≥ 78 cm. All of the sampled large fish except one (35 of 36) were Dworshak stock.

Tribal Drano Lake fishery

We estimate that nearly 82% percent (90% CI, 69.2% to 91.2%) of the clipped harvest was from Snake River hatchery stocks and the remaining 18% from hatchery stocks outside the Snake River basin. The Dworshak stock composed over 50% of the clipped harvest, with BY2009 contributing over 47% of the harvest (Table 21 and Figure 15). The estimated stock percentages and 90% confidence intervals of all release groups can be found in Table 21. About 46% of the fish were females and 63% were ≥ 78 cm. Twenty of the 26 large fish (77%) were Dworshak stock.

Lower Snake River sport fishery

We estimated that over 99% of the harvest came from Snake River basin hatchery fish and Lyons Ferry releases in the Walla Walla River basin. About 0.8% of the harvest was attributed to non-Snake and non-Lyons Ferry stocks. The largest contribution to harvest was from Lyons Ferry (37%), Dworshak (24%), and Pahsimeroi (13%) stocks (Table 22 and Figure 16). The largest contribution to harvest was from the Lyons Ferry BY2010 and Dworshak BY2009 release groups (Table 23). These two release groups made up nearly 48% of the total harvest. The harvest estimates and 90% CI for all release groups are shown in Table 23.

We were able to identify the sex of 640 fish using the genetic sex marker. We found that females made up 46.7% of the harvest. The percentage of female by release group ranged from 30% to 49.8% for groups with a sample size >10 (Table 24). We used all samples to calculate that about 23% of the harvested fish were ≥ 78 cm fork length. We found that over 87% of the large fish were from the Dworshak release groups.

Estimating stock proportions and harvest contribution for unclipped steelhead

Tribal Columbia River Zone 6 fishery

During the period from August 1 to August 20, we estimated that 20.4% (90% CI, 12.9% to 28.9%) of the unclipped steelhead harvest (383 fish) was from Snake River basin hatcheries. The largest hatchery contribution came from the Dworshak release group (105 fish or nearly 6% of total harvest). The remaining 79.6% of the harvest (1,498 fish) was putative wild fish that were assigned to the GSI reporting groups. The MGILCS reporting group contributed nearly 57% of the harvest (1,070 fish). All other groups each contributed less than 7% to the total harvest in this period (Table 25 and Table 26, Figure 17).

During the period from August 21 to November 10, we estimated that about 27% (90% CI, 23.1% to 30.6%) of the unclipped steelhead harvest (970 fish) were from Snake River basin hatcheries. The Dworshak hatchery release groups contributed 603 fish—nearly 17% of the total harvest. The remaining 73% of the harvest (2,642 fish) were putative wild fish that were assigned to the GSI reporting groups. The MGILCS reporting group contributed about 46% of the harvest (1,663 fish). All other groups each contributed less than 6% to the total harvest in this period (Table 26 and Table 27, Figure 18).

When harvest estimates were combined for both periods, the unclipped Snake River basin hatchery release groups contributed about 25% (90% CI, 20.9% to 28.5%) of the total

harvest. The Dworshak release groups contributed about 13% of the total harvest. All other hatchery release groups each contributed less than 2% to the total harvest. The MGILCS reporting group contributed about 50% of the harvest (2,733) and made the largest contribution to the total harvest. All other GSI reporting groups each contributed less than 5% to the total harvest (Table 26 and Table 28, Figure 19). We can account for 42% of the total harvest originating from the Snake River basin (25% from hatchery stocks and 17% from Idaho GSI groups). The actual contribution from the Snake River basin in this fishery is likely much higher as many fish that assigned to the MGILCS were probably bound for Snake River tributaries.

We estimated that about 53% of the total unclipped harvest were female fish. The percentage of female by release group ranged from 43.3% to 75% for groups with a sample size >10 (Table 29). We used all samples to calculate that about 43% of the unclipped fish were ≥ 78 cm fork length. We found that about 31% of the large fish were from the Dworshak release group and 26% were from the MGILCS reporting group. Another 34% of the large fish came from the Idaho GSI reporting groups—Middle Fork Salmon River (MFSALM), South Fork Clearwater River (SFCLWR), Lochsa and Selway rivers (UPCLWR), South Fork Salmon River (SFSALM), and the Upper Salmon River (UPSALM). The Dworshak release group was the only hatchery group that had large steelhead sampled (Table 29).

Tribal Drano Lake fishery

We estimate that 14.4% percent (90% CI, 7.4% to 24.3%) of the unclipped harvest were hatchery fish from the Snake River basin. Another 10% of the harvest were from Idaho GSI reporting groups. The MGILCS group made up 56% of the harvest and was the largest contribution to the unclipped harvest (Figure 21). The estimated stock composition percentages and 90% confidence intervals can be found in Table 20. We estimated that 49.2% of the unclipped harvest were fish ≥ 78 cm fork length and that 40.4% of the fish were females. Most of the large fish were from the MGILCS (19%) reporting group, followed by KCLICKR (12%), and Dworshak hatchery stock (8%).

DISCUSSION

Hatcheries in the Snake River basin produce the majority of summer steelhead smolts released in the entire Columbia River basin during MY 2009 to 2011. About 70% of the total number of smolts released in the entire Columbia River and about 82% of the summer steelhead smolts released upstream of Bonneville Dam come from the Snake River basin. The smolts released in MY 2009 to 2011 returned to the Columbia River in 2012 as one, two, and three ocean adults. Production from the Snake River basin hatcheries provide fishing opportunity for tribal and non-tribal fishers throughout the Columbia and Snake rivers. In the past, steelhead harvest in the Columbia River sport fisheries was reported as number of fish caught and in the tribal fisheries as the number of Group A and Group B clipped and unclipped fish caught. With the initiation of sampling steelhead fisheries for genetic analysis we are able to parse harvest into many more groups. In 2012, we were able to assign harvest in the lower Columbia sport fishery to 24 hatchery release group/brood year categories and the tribal harvest in Zone 6 to 26 hatchery release group/brood year categories and 11 GIS reporting groups. Steelhead harvest in the 2012 lower Columbia River sport fishery was about 4,700 fish less than 2011. The hatchery stock composition of the sport harvest was similar to that of 2011 except for Pahsimeroi and the Other stock. The Pahsimeroi stock contribution in 2012 was 16% compared to 26% in 2011. The Other stock contribution in 2012 was 31% compared to 22% in 2011. All other hatchery stocks contributions in 2012 were within $\pm 3\%$ of their 2011 values (Appendix A).

The steelhead harvest in the tribal Zone 6 fishery also declined in 2012 compared to 2011. In 2012, total harvest was 15,211 (5,493 unclipped and 9,718 clipped) fish compared to 27,499 in 2011 (9,295 unclipped and 18,204 clipped). The contribution of the Dworshak stock in 2012 was about 20% to the total harvest compared to nearly 40% in 2011. The Other stock made up 9.4% of the total 2012 harvest compared to 3.7% in 2011. All of the remaining hatchery stocks were within $\pm 5\%$ of their 2011 contribution to total harvest. The MGILCS reporting group had the largest change of GSI reporting group contribution to the total harvest in 2012 compared to 2011. In 2012, the MGILCS contributed 18.1% to the total harvest compared to 12.4% in 2011. All other GSI reporting group contributions in 2012 were within $\pm 1\%$ of their 2011 values (Appendix B).

We did not collect any samples from the tribal Zone 6 platform fishery from August 1 to August 20. Steelhead harvest during this three-week period was 4,490 (nearly 30% of the total). We decided to estimate the stock composition of the clipped and unclipped steelhead harvest in two time periods, August 1 to August 20 and August 21 to November 11, because of steelhead run timing differences observed at Bonneville Dam (Figure 6). The passage of the Dworshak hatchery stock was only 3% complete on August 20, whereas all other hatchery stocks (except the EF Salmon and Upper Salmon) were at least 50% complete and most over 70% complete. Since our first sample was collected on August 22, we decided to use samples collected from that date until August 30 and assumed that it represented the stock composition during the August 1 to August 20 time period. The Dworshak passage was only 9% complete at Bonneville Dam on August 30. If we did not do this the contribution of the Dworshak stock would have been overestimated in the August 1 to August 20 platform fishery.

The contribution of the Dworshak stock (fish harvested and percentage of the harvest) in the tribal Zone 6 harvest declined in 2012 compared to 2011. Despite the decline, the Dworshak stock was the largest contributor to the 2012 harvest as it was in 2011 (Appendix B). The reduction in 2012 may be explained by a later timed run of this stock past Bonneville Dam this year compared to 2011 (Appendix C). In 2011, Dworshak steelhead attained the 50% passage date at Bonneville Dam on September 12—two days after the 50% passage date for fall Chinook. In, 2012, Dworshak steelhead attained the 50% passage date at Bonneville Dam on September 19—ten days after the 50% passage date for fall Chinook. In both years, the majority of the fall Chinook harvest took place in statistical weeks 37 to 39 (74% in 2011 and 79% in 2012). At the start of commercial fishing in statistical week 37, 31% of the Dworshak run had passed Bonneville Dam in 2011 compared to 16% in 2012. Most Dworshak steelhead return after two years in the ocean and are larger than the other steelhead stocks. The fall Chinook commercial Zone 6 fishery uses 9" mesh that is more efficient catching larger fish. Due to the later run timing of Dworshak steelhead in 2012, less of these fish were available to harvest during the peak fishing period in statistical weeks 37 to 39. The later run timing of Dworshak steelhead is also reflected in its contribution to the lower Columbia River sport fishery. This fishery caught most of the steelhead in July and August. In 2012, the percentage of Dworshak steelhead in the sport harvest was 4% compared to 6% in 2011 (Appendix A).

The three areas we sampled sport fisheries in the Columbia River upstream of Bonneville Dam all had different stock compositions. The samples we obtained from these fisheries were collected during different time periods (Table 7); hence, the stock composition differences may be a reflection of run timing differences among the hatchery stocks. The samples from the Washington shore fisheries were collected the earliest and had the largest non-Snake River contribution (27%) and the lowest Dworshak contribution (2%) of the three areas (Figure 12). The John Day Arm fishery, which begins later in the year and was sampled the latest, had the largest contribution of Dworshak stock (38%) in the three fisheries. We were

able to assign all of the samples from the John Day Arm to Snake River stocks (Figure 14). Angler effort in the mouth of the Deschutes fishery began later than the Washington shore and earlier than the John Day Arm. In this fishery we assigned 95% of the stocks to Snake River hatchery stocks. The largest hatchery contribution was from the Pahsimeroi (27%) and Wallowa (21%) stocks. The Dworshak stock made up 12% of the stock composition in this fishery (Figure 13).

The stock composition from the Snake River sport fishery downstream of Lower Granite Dam was made up almost entirely of Snake River stocks. We assigned less than 1% of the stock composition in the harvest to non-Snake River hatchery stocks (Figure 16). The Lyons Ferry stock had the largest contribution to total harvest (37%), followed by the Dworshak (24%), and Pahsimeroi (13%) stocks. Unlike the other fisheries we sampled, steelhead fishing in the lower Snake River continued until the next spring. We noted differences in stock composition in the September 1 to December 31, 2012 harvest compared to the January 1 to March 31, 2013 harvest. In fall/winter 2012 harvest the three largest contributors to the stock composition were Lyons Ferry (30%), Dworshak (27%), and Pahsimeroi (15%). In the winter/spring 2013 harvest these stocks again were the largest contributors to harvest; however, the percentages differed. In the winter/spring 2013 harvest Lyons Ferry made up 69% of the harvest, Dworshak 14%, and Pahsimeroi 7%.

As was the case in 2011, the Dworshak stock was the largest contributor of large fish (Group B ≥ 78 cm) caught by fishers in the Columbia River. Dworshak made up 81% of the large clipped fish caught in the Zone 6 tribal, 35% of the large unclipped fish in the Zone 6 tribal, 71% in the Zone 6 mouth of the Deschutes sport, 97% in the Zone 6 John Day Arm sport, and 86% in the Snake River sport downstream of LGR. Dworshak provided 31% of the large fish caught in the lower Columbia River sport fishery despite only accounting for 4% of the harvest. In the Washington shore Zone 6 sport fishery, Dworshak provided 33% of the large fish despite accounting for only 2% of the harvest. In both of these fisheries the non-Snake hatchery group had a higher percentage of large fish (42% in the lower Columbia River and 50% in the Washington shore).

The MGILCS reporting group accounted for 2,747 fish or 18.1% of the total steelhead harvest the Zone 6 tribal fishery (Appendix B). This geographically large area encompasses many large river basins including the Deschutes, John Day, Umatilla, Tucannon, Grande Ronde, and Imnaha. Genetic reporting groups were developed at smaller scales for rivers within the MGILCS group; however, the accuracy of assignments to these smaller groups was less precise. We have chosen accuracy of assignment over geographic spatial scale to assign unclipped fish that do not assign to Snake River hatchery stocks with PBT. The GSI reporting groups we use are the same as those CRITFC uses to place unclipped fish that do not assign to a Snake River basin hatchery release group with PBT in a GSI reporting group at Bonneville Dam (Hess et al. 2013).

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Table 1. The number of CWT recovered from Snake River steelhead stocks in the Columbia River sport fishery downstream of Bonneville Dam from 2001 to 2010.

Hatchery Stock	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Dworshak	5	9	3	0	4	7	5	4	4	19	6
EF Salmon	0	0	0	0	0	0	0	0	0	1	<1
Imnaha	8	9	5	5	10	5	3	1	10	7	6
Lyons Ferry	11	20	3	9	6	6	5	6	17	32	12
Oxbow	12	13	2	5	3	2	5	2	25	30	10
Pahsimeroi	19	12	3	3	5	2	21	19	45	35	16
Sawtooth	16	12	1	1	4	0	14	6	15	26	10
Upper Salmon	0	0	0	0	0	0	0	1	0	3	<1
Wallowa	28	14	8	6	7	18	37	20	75	82	30
Yearly Total	99	89	25	29	39	40	90	59	191	235	90

Table 2. The number of CWT recovered from Snake River steelhead stocks in the Columbia River tribal Zone 6 fishery in the ten years before genetic sampling was initiated..

Hatchery Stock	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Dworshak	54	151	62	38	38	101	81	186	28	142	88
EF Salmon	0	0	0	0	0	0	2	0	0	20	2
Imnaha	19	7	11	9	14	4	10	2	1	2	8
Lyons Ferry	32	5	5	15	12	5	5	17	3	18	12
Oxbow	25	13	11	13	8	0	6	4	13	23	12
Pahsimeroi	38	18	5	9	7	2	42	17	50	28	22
Sawtooth	70	32	10	5	2	0	35	13	25	31	22
Upper Salmon	0	0	0	0	0	0	2	8	5	7	2
Wallowa	86	35	27	19	33	23	46	44	64	84	46
Yearly Total	324	261	131	108	114	135	229	291	189	352	214

Table 3. Summer Steelhead smolt releases by Region and Brood Year (BY) in the Columbia River basin. BY08 releases were the 3-ocean adult returns, BY09 were the 2-ocean adult returns, and BY10 were the 1-ocean returns in the fall 2012. Data was downloaded from Fish Passage Center website (<http://www.fpc.org>) on January 11, 2013. Clipped and unclipped refer to the adipose fin.

Brood Year (BY)	Unclipped smolts	Clipped smolts	Total smolt release
BY 2010	1,759,113	11,760,181	13,519,294
Downstream of Bonneville Dam ^a	17,387	1,920,732	1,938,119
Bonneville Dam to McNary Dam	21,032	435,921	456,953
Upstream of McNary Dam ^b	397,528	970,041	1,367,569
Snake River basin	1,323,166	8,433,487	9,756,653
BY 2009	1,505,658	10,078,215	11,583,873
Downstream of Bonneville Dam ^a	14,213	1,811,609	1,825,822
Bonneville Dam to McNary Dam	2,902	482,756	485,658
Upstream of McNary Dam ^b	425,533	985,112	1,410,645
Snake River basin	1,063,010	6,798,738	7,861,748
BY 2008	1,529,316	10,787,864	12,317,180
Downstream of Bonneville Dam ^a	65,428	1,854,895	1,920,323
Bonneville Dam to McNary Dam	9,604	522,464	532,068
Upstream of McNary Dam ^b	327,764	874,062	1,201,826
Snake River basin	1,126,520	7,536,443	8,662,963

^a Includes the Willamette River basin.
^b Excluding the Snake River basin.

Table 4. Monthly Steelhead harvest estimates and the number of fish sampled from July 1, 2012 to October 31, 2012 in the lower Columbia River sport fishery.

Month	Harvest	Percent of harvest	Samples collected	Percent of samples	Samples analyzed
July	10,305	64.7%	1,127	62.4%	535
August	4,766	29.9%	646	35.8%	260
September	639	4.0%	23	1.3%	23
October	213	1.3%	10	0.6%	10
Total	15,923		1,806		828

Table 5. Tribal clipped Steelhead harvest and the number of samples collected in the fall 2012 fishery. The dates for Stat weeks 35 through 41 were the open dates for treaty commercial gillnets. Platform fisheries were open daily from August 1 to November 10, 2012.

Stat Week	Start Date	End Date	Platform harvest	Net harvest	Total harvest	Percent of harvest	Samples collected	Percent of samples	Samples used for analysis
32-34	8/1	8/20	2,609	0	2,609	26.8%	0	--	--
35	8/21	8/23	412	171	582	6.0%	61	8.7%	60
36	8/27	8/30	288	318	606	6.2%	48	6.8%	33
37	9/4	9/8	302	1,241	1,542	15.9%	195	27.7%	159
38	9/11	9/14	395	922	1,317	13.5%	97	13.8%	95
39	9/18	9/21	282	1,254	1,536	15.8%	124	17.6%	119
40	9/26	9/28	31	599	630	6.5%	59	8.4%	58
41	10/2	10/4	162	444	606	6.2%	113	16.1%	70
42+	10/5	11/10	290	0	290	3.0%	6	0.9%	3
Total:			4,771	4,947	9,718		703		597

Table 6. Tribal unclipped Steelhead harvest and the number of samples collected in the fall 2012 fishery. The dates for Stat weeks 35 through 41 were the open dates for treaty commercial gillnets. Platform fisheries were open daily from August 1 to November 10, 2012.

Stat Week	Start Date	End Date	Platform harvest	Net harvest	Total harvest	Percent of harvest	Samples collected	Percent of samples	Samples used for analysis
32-34	8/1	8/20	1,881	0	1,881	19.4%	0	--	--
35	8/21	8/23	388	161	549	5.7%	40	8.9%	39
36	8/27	8/30	152	167	318	3.3%	43	9.5%	34
37	9/4	9/8	138	568	707	7.3%	124	27.5%	112
38	9/11	9/14	155	362	518	5.3%	54	12.0%	53
39	9/18	9/21	128	566	694	7.1%	77	17.1%	75
40	9/26	9/28	19	367	386	4.0%	30	6.7%	30
41	10/2	10/4	88	241	330	3.4%	76	16.9%	55
42+	10/5	11/10	110	0	110	1.1%	7	1.6%	5
Total:			3,059	2,433	5,493		451		403

Table 7. The number of steelhead sampled in Columbia River Zone 6 sport fisheries during the summer and fall of 2012. Four samples were collected between February 14 and March 2, 2013 in the John Day Arm fishery.

Start	Stat Week	WA shore	Mouth of Deschutes	John Day Arm
7/9	29	6		
7/16	30	24		
7/23	31	14		
7/30	32	17		
8/6	33	22		
8/13	34	1	6	
8/20	35		14	
8/27	36		20	
9/3	37		15	
9/10	38		12	
9/17	39	3	1	
9/24	40	1		
10/1	41		1	2
10/8	42			8
10/15	43		1	4
10/22	44			22
10/29	45			10
11/5	46			12
11/12	47			36
11/19	48			0
11/26	49			10
12/3 to 12/31/12				15
2/14 to 3/2/13				4
Total samples collected:		88	70	123

Table 8. Monthly steelhead harvest estimates and the number of samples collected and analyzed to estimate stock composition in the lower Snake River sport fishery from September 1, 2012 to March 31, 2013.

Month	Harvest estimate		Samples collected		Samples analyzed	
	Total	% of total	Total	% of total	Total	% of total
September	1,899	27%	180	19%	154	24%
October	1,671	23%	286	31%	150	24%
November	1,072	15%	184	20%	99	16%
December	949	13%	156	17%	111	18%
January	672	9%	44	5%	43	7%
February	467	7%	42	5%	41	6%
March	430	6%	38	4%	36	6%
Total	7,160		930		634	

Table 9. Description of hatchery stocks, release groups, and tag rates for Brood Years 2008 (3-ocean adults), 2009 (2-ocean adults), and 2010 (1-ocean adults) that were included in the PBT parental baseline used to make assignments. SBT = Shoshone-Bannock Tribe. na = no fish in this BY release group. NS = not sampled, hence tag rate was zero.

Hatchery Stock	Release group	Tag Rate		
		BY2008	BY2009	BY2010
Dworshak	Dworshak	0.6749	0.9776	0.9680
EF Salmon - spawned at Sawtooth	EF_Sawtooth	0.9615	1.0000	1.0000
Imnaha	Imnaha	1.0000	1.0000	0.8836
Lyons Ferry ^a	Lyons Ferry	NS	0.9906	1.0000
Oxbow	Oxbow	0.9089	0.8750	0.9580
Pahsimeroi - general production	Pahsimeroi	0.9415	0.9483	0.9703
Pahsimeroi - SBT Indian Creek egg box	SBT_Indian	na	0.9107	0.9524
Pahsimeroi - SBT Panther Creek egg box	SBT_Panther	na	0.9540	0.9615
Pahsimeroi - SBT programs (no release location data)	SBT_Pah	0.9938	na	0.8125
Sawtooth - general production	Sawtooth	0.9928	1.0000	0.9952
Sawtooth - SBT Basin Creek egg box	SBT_Basin	1.0000	0.9832	na
Sawtooth - SBT Smolt release at Sawtooth	SBT_Sawtooth	0.9143	na	na
Sawtooth - SBT Yankee Fork egg box	SBT_YF_Egg	na	na	1.0000
Sawtooth - SBT Yankee Fork smolt release	SBT_Yankee	1.0000	1.0000	1.0000
Touchet endemic	LF_Touchet	NS	0.8889	0.6429
Tucannon endemic	LF_Tucannon	NS	0.8750	0.6944
Upper Salmon	Upper Salmon	1.0000	1.0000	0.9600
Wallowa – Cottonwood Pond release	Cottonwood	0.9647	0.9583	1.0000
Wallowa—all release sites except Cottonwood Pond	Wallowa	NS	0.9094	0.9761

^a The Lyons Ferry stock is also released in the Walla Walla River basin.

Table 10. The percentage of unclipped hatchery fish identified with PBT that assigned to GSI groups. The percentage represent where the release group would assign if PBT was not used. These percentages were used to subtract fish from the GSI groups after the hatchery release groups were expanded for tagging rate. n = number of fish identified with PBT.

Release group	n	GSI Reporting Group					
		MFSALM	MGILCS	SFCLWR	UPCLWR	UPPCOL	UPSALM
Dworshak	173	0.00%	4.62%	94.22%	1.16%	0.00%	0.00%
EF_Sawtooth	21	0.00%	23.53%	11.76%	0.00%	0.00%	64.71%
Upper Salmon		0.00%	23.53%	11.76%	0.00%	0.00%	64.71%
Oxbow	9	0.00%	33.33%	0.00%	0.00%	0.00%	66.67%
Pahsimeroi	19	0.00%	42.11%	0.00%	0.00%	5.26%	52.63%
LF_Tucannon	11	0.00%	63.64%	0.00%	0.00%	27.27%	9.09%
Imnaha		0.00%	63.64%	0.00%	0.00%	27.27%	9.09%
Lyons Ferry		0.00%	63.64%	0.00%	0.00%	27.27%	9.09%
Wallowa	4	0.00%	100.0%	0.00%	0.00%	0.00%	0.00%
Sawtooth	37	2.70%	24.32%	0.00%	0.00%	0.00%	72.97%
SBT_Yankee		2.70%	24.32%	0.00%	0.00%	0.00%	72.97%

Table 11. The number of steelhead counted at Bonneville Dam (BON) and the estimated passage of hatchery (Hat) and wild Group A and Group B steelhead from July 1 to October 31, 2012.

Start	End	BON Count		Clip Estimate		Unclip Estimate				Estimated Abundance					
		Clipped	Unclip	Hat A	Hat B	Wild A	Hat A	Wild B	Hat B	Wild A	Hat A	Total A	Wild B	Hat B	Total B
7/1	7/8	3,631	3,154	3,631	0	2,703	451	0	0	2,703	4,082	6,785	0	0	0
7/9	7/15	6,618	6,458	6,618	0	6,007	300	150	0	6,007	6,918	12,926	150	0	150
7/16	7/22	11,294	10,286	11,294	0	8,260	1,714	156	156	8,260	13,008	21,268	156	156	312
7/23	7/29	14,941	11,242	14,941	0	10,059	1,183	0	0	10,059	16,124	26,183	0	0	0
7/30	8/5	14,982	9,659	14,790	192	7,579	1,486	594	0	7,579	16,276	23,855	594	192	786
8/6	8/12	15,716	8,458	15,716	0	6,677	1,558	223	0	6,677	17,274	23,951	223	0	223
8/13	8/19	13,792	6,592	13,792	0	5,179	0	1,413	0	5,179	13,792	18,971	1,413	0	1,413
8/20	8/26	7,818	3,975	7,511	307	2,342	1,278	284	71	2,342	8,789	11,132	284	378	661
8/27	9/2	11,077	4,628	10,128	949	2,198	1,736	579	116	2,198	11,863	14,061	579	1,065	1,644
9/3	9/9	9,831	3,936	7,865	1,966	1,243	1,450	829	414	1,243	9,315	10,558	829	2,381	3,209
9/10	9/16	9,242	3,908	6,654	2,588	1,421	1,421	711	355	1,421	8,075	9,496	711	2,943	3,654
9/17	9/23	7,764	2,988	4,211	3,553	779	909	650	650	779	5,120	5,900	650	4,203	4,852
9/24	9/30	5,346	2,043	1,855	3,491	292	389	486	876	292	2,244	2,536	486	4,367	4,853
10/1	10/7	3,274	1,240	1,468	1,806	165	248	289	537	165	1,716	1,881	289	2,344	2,633
10/8	10/14	1,927	801	771	1,156	305	153	191	153	305	923	1,229	191	1,309	1,499
10/15	10/31	2,188	1,048	928	1,260	253	221	260	314	253	1,149	1,402	260	1,574	1,834
Total:		139,441	80,416	122,172	17,269	55,464	14,497	6,813	3,641	55,464	136,670	192,134	6,813	20,910	27,723

Table 12. Actual, expanded, and percent of samples that assigned to Hatchery release groups that was used to estimate the lower Columbia River sport harvest from July 1 to October 31, 2012. ns = not sampled. The sum of the expanded BY columns may not equal the total sample size due to rounding error.

Release group	PBT Assignments								Percent of expanded samples			
	Actual Count				Expanded for Tag rate							
	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total
Dworshak	1	26	3	30	1.5	26.6	3.1	31.2	0.2%	3.2%	0.4%	3.8%
EF_Sawtooth	0	1	0	1	0	1	0	1	0.0%	0.1%	0.0%	0.1%
Cottonwood	0	7	18	25	0	7.3	18	25.3	0.0%	0.9%	2.2%	3.1%
LF_Touchet	ns	1	0	1		1.1	0	1.1		0.1%	0.0%	0.1%
Imnaha	0	8	2	10	0	8	2.3	10.3	0.0%	1.0%	0.3%	1.2%
Lyons Ferry	ns	16	34	50		16.2	34	50.2		2.0%	4.1%	6.1%
Oxbow	1	110	14	125	1.1	125.7	14.6	141.4	0.1%	15.2%	1.8%	17.1%
Pahsimeroi	0	53	76	129	0	55.9	78.3	134.2	0.0%	6.8%	9.5%	16.2%
Sawtooth	0	21	76	97	0	21	76.4	97.4	0.0%	2.5%	9.2%	11.8%
SBT_Basin	0	1	0	1	0	1		1	0.0%	0.1%		0.1%
SBT_Yankee	0	7	9	16	0	7	9	16	0.0%	0.9%	1.1%	1.9%
Wallowa	ns	36	21	57		39.6	21.5	61.1		4.8%	2.6%	7.4%
Snake River total	2	287	253	542	2.58	310.4	257.2	570.2	0.3%	37.5%	31.1%	68.9%
Other				286				257.9				31.1%
Total:	2	287	253	828	2.6	310.4	257.2	828				

Table 13. Estimated release group percentages, 90% bootstrap CIs, and harvest contribution (by release group and brood year (BY) in the lower Columbia River sport fishery from July 1 to October 31, 2012. LCI = lower 90% CI; UCI = upper 90% CI.

Release Group	BY	Percent of harvest			Harvest by Group		
		Estimate	LCI	UCI	Estimate	LCI	UCI
Dworshak	2008	0.2%	0.0%	0.5%	28	0	85
Dworshak	2009	3.2%	2.2%	4.3%	511	354	688
Dworshak	2010	0.4%	0.1%	0.7%	60	20	119
EF_Sawtooth	2009	0.1%	0.0%	0.4%	19	0	58
Cottonwood	2009	0.9%	0.4%	1.5%	140	60	241
Cottonwood	2010	2.2%	1.4%	3.0%	346	231	481
LF_Touchet	2009	0.1%	0.0%	0.4%	22	0	65
Imnaha	2009	1.0%	0.5%	1.6%	154	77	250
Imnaha	2010	0.3%	0.0%	0.7%	44	0	109
Lyons Ferry	2009	2.0%	1.2%	2.8%	311	194	447
Lyons Ferry	2010	4.1%	3.0%	5.3%	654	481	846
Oxbow	2008	0.1%	0.0%	0.4%	21	0	63
Oxbow	2009	15.2%	13.0%	17.4%	2,418	2,066	2,769
Oxbow	2010	1.8%	1.0%	2.5%	281	161	401
Pahsimeroi	2009	6.7%	5.2%	8.3%	1,075	831	1,318
Pahsimeroi	2010	9.5%	7.8%	11.2%	1,506	1,249	1,784
Sawtooth	2009	2.5%	1.7%	3.5%	404	269	558
Sawtooth	2010	9.2%	7.5%	10.9%	1,469	1,198	1,739
SBT_Basin	2009	0.1%	0.0%	0.4%	20	0	59
SBT_Yankee	2009	0.8%	0.4%	1.3%	135	58	212
SBT_Yankee	2010	1.1%	0.5%	1.7%	173	77	269
Wallowa	2009	4.8%	3.5%	6.1%	761	550	973
Wallowa	2010	2.6%	1.7%	3.6%	414	276	571
Snake River total		68.9%	66.0%	71.7%	10,965	10,509	11,423
Other	--	31.1%	28.3%	34.0%	4,959	4,500	5,415

Table 14. Percent of female and large fish (fork length ≥ 78 cm) by release group in the lower Columbia River sport harvest. All brood years were combined for this analysis. The percent large all samples column is the percent the total large fish sampled from each release group. The percent large within group column is the percent of large fish within each release group. For example, 32.1% of all large fish came from the Dworshak group and 83.3% of the Dworshak release group were large.

Release group	Actual count					Count expanded for PBT Tag rate			
	Sample size (sex)	Percent female	Sample size (length)	Number of large fish	Percent large within group	Sample size (length)	Number of large fish	Percent large - all samples	Percent large within group
All samples	828	45.9%	826	81	--	826	81	9.8%	--
Dworshak	30	27.6%	30	25	83.3%	31.2	26.0	32.1%	
EF_Sawtooth	1	100.0%	1	1	100.0%	1.0	1.0	1.2%	
Cottonwood	25	41.7%	25	0	0.0%	25.3	0.0	0.0%	
LF_Touchet	1	100.0%	1	0	0.0%	1.1	0.0	0.0%	
Imnaha	10	70.0%	10	0	0.0%	10.3	0.0	0.0%	
Lyons Ferry	50	53.1%	50	1	2.0%	50.2	1.0	1.2%	
Oxbow	125	61.7%	125	10	8.0%	141.4	11.3	14.0%	
Pahsimeroi	129	42.1%	129	2	1.6%	134.2	2.1	2.6%	
Sawtooth	97	37.9%	97	2	2.1%	97.4	2.0	2.5%	
SBT_Basin	1	100.0%	1	0	0.0%	1.0	0.0	0.0%	
SBT_Yankee	16	71.4%	16	0	0.0%	16.0	0.0	0.0%	
Wallowa	57	47.3%	57	6	10.5%	61.1	6.4	7.9%	
All Snake River						570.1	49.8	61.5%	
Other	286	41.4%	284	34		255.9	31.2	38.5%	12.2%

Table 15. Actual, expanded, and percent of samples that assigned to Hatchery release groups that was used to estimate the tribal Zone 6 clipped harvest from August 1 to August 20 and August 21 to November 10, 2012. ns = not sampled. The sum of the expanded BY columns may not equal the total sample size due to rounding error.

Release group	PBT Assignments								Percent of expanded samples			
	Actual Count				Expanded Count							
	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total
<u>August 1 to August 20</u>												
Dworshak	0	5	0	5	0.0	5.1	0.0	5.1	0.0%	5.5%	0.0%	5.5%
Cottonwood	0	2	4	6	0.0	2.1	4.0	6.1	0.0%	2.2%	4.3%	6.5%
Lyons Ferry	0	1	5	6		1.0	5.0	6.0	0.0%	1.1%	5.4%	6.5%
Oxbow	0	14	2	16	0.0	16.0	2.1	18.1	0.0%	17.2%	2.2%	19.4%
Pahsimeroi	0	6	5	11	0.0	6.3	5.2	11.5	0.0%	6.8%	5.5%	12.3%
Sawtooth	0	1	7	8	0.0	1.0	7.0	8.0	0.0%	1.1%	7.6%	8.6%
SBT_Yankee	0	0	2	2	0.0	0.0	2.0	2.0	0.0%	0.0%	2.2%	2.2%
Wallowa	ns	9	2	11		9.9	2.0	11.9	0.0%	10.6%	2.2%	12.8%
All Snake	0	38	27	65	0.0	41.4	27.3	68.8	0.0%	44.6%	29.4%	73.9%
Other				28				24.2				26.1%
8/1 - 8/21 total		38	27	93	0.0	41.4	27.3	93				
<u>August 21 to end of season</u>												
Dworshak	13	153	7	173	19.3	156.5	7.2	183.0	3.2%	26.2%	1.2%	30.7%
Cottonwood	0	6	16	22	0.0	6.3	16.0	22.3	0.0%	1.0%	2.7%	3.7%
Imnaha	0	5	2	7	0.0	5.0	2.3	7.3	0.0%	0.8%	0.4%	1.2%
Lyons Ferry	ns	4	11	15		4.0	11.0	15.0	0.0%	0.7%	1.8%	2.5%
Oxbow	0	64	3	67	0.0	73.1	3.1	76.3	0.0%	12.3%	0.5%	12.8%
Pahsimeroi	0	41	41	82	0.0	43.2	42.3	85.5	0.0%	7.2%	7.1%	14.3%
Sawtooth	0	19	49	68	0.0	19.0	49.2	68.2	0.0%	3.2%	8.2%	11.4%
SBT_Yankee	0	3	12	15	0.0	3.0	12.0	15.0	0.0%	0.5%	2.0%	2.5%
Upper Salmon	1	0	0	1	1.0	0.0	0.0	1.0	0.2%	0.0%	0.0%	0.2%
Wallowa	ns	48	8	56		52.8	8.2	61.0	0.0%	8.8%	1.4%	10.2%
All Snake	14	343	149	506	20.3	363.0	151.3	534.5	3.4%	60.8%	25.3%	89.5%
Other				91				62.5				10.5%
8/21 to end	14	343	149	597	20.3	363.0	151.3	597				

Table 16. Estimated release group percentages, 90% bootstrap CIs, and harvest contribution for the tribal Zone 6 clipped steelhead harvest from August 1 to August 20 and August 21 to November 10, 2012. LCI = lower 90% CI; UCI = upper 90% CI.

Group	BY	August 1 to August 20						August 21 to November 10						Total Harvest		
		Estimate	LCI	UCI	Harvest estimate	Harvest LCI	Harvest UCI	Estimate	LCI	UCI	Harvest estimate	Harvest LCI	Harvest UCI	Harvest estimate	Harvest LCI	Harvest UCI
Dworshak	2008	0.0%						3.2%	1.7%	4.7%	229	124	335	229	124	335
Dworshak	2009	5.5%	2.2%	9.9%	143	57	258	26.2%	23.1%	29.3%	1,862 ^a	1,644	2,083	2,005	1,702	2,341
Dworshak	2010	0.0%						1.2%	0.5%	2.1%	86	37	148	86	37	148
Cottonwood	2009	2.2%	0.0%	5.6%	59	0	146	1.0%	0.3%	1.7%	75	25	124	134	25	271
Cottonwood	2010	4.3%	1.1%	7.5%	112	28	196	2.7%	1.7%	3.9%	191	119	274	303	147	470
Imnaha	2009	0.0%						0.8%	0.3%	1.5%	60	24	107	60	24	107
Imnaha	2010	0.0%						0.4%	0.0%	0.9%	27	0	67	27	0	67
Lyons Ferry	2009	1.1%	0.0%	3.3%	28	0	85	0.7%	0.2%	1.4%	48	12	96	76	12	181
Lyons Ferry	2010	5.4%	2.2%	9.7%	140	56	252	1.8%	1.0%	2.8%	131	71	202	271	128	455
Oxbow	2009	17.2%	11.1%	24.6%	449	289	641	12.3%	10.0%	14.7%	871	708	1,048	1,320	996	1,689
Oxbow	2010	2.2%	0.0%	5.6%	59	0	146	0.5%	0.2%	1.0%	37	12	75	96	12	221
Pahsimeroi	2009	6.8%	2.3%	11.3%	177	59	296	7.2%	5.5%	9.0%	515	389	640	692	448	936
Pahsimeroi	2010	5.5%	2.2%	10.0%	145	58	260	7.1%	5.4%	8.8%	503	380	626	648	438	886
Sawtooth	2009	1.1%	0.0%	3.2%	28	0	84	3.2%	2.0%	4.4%	226	143	310	254	143	394
Sawtooth	2010	7.6%	3.2%	11.9%	197	85	310	8.2%	6.6%	10.1%	586	467	718	783	551	1,028
SBT_Yankee	2009	0.0%						0.5%	0.2%	1.0%	36	12	71	36	12	71
SBT_Yankee	2010	2.2%	0.0%	4.3%	56	0	112	2.0%	1.2%	3.0%	143	83	214	199	83	327
Upper Salmon	2008	0.0%						0.2%	0.0%	0.5%	12	0	36	12	0	36
Wallowa	2009	10.6%	5.9%	16.6%	278	154	432	8.8%	6.8%	10.9%	629	484	773	907	639	1,204
Wallowa	2010	2.2%	0.0%	5.5%	57	0	144	1.4%	0.7%	2.2%	98	49	159	155	49	302
Snake River total		73.9%	65.6%	82.1%	1,929	1,711	2,141	89.5%	86.9%	92.1%	6,365	6,177	6,550	8,294	7,889	8,691
Other	--	26.1%	18.0%	34.4%	680	468	898	10.5%	7.9%	13.1%	744	559	932	1,424	1,027	1,829

^a Two fish were subtracted to account for rounding error when summing harvest estimates for August 21 to November 10 period.

Table 17. Estimated release group percentages, 90% bootstrap CIs, and harvest contribution for the tribal Zone 6 clipped steelhead harvest from August 1 to November 10, 2012. LCI = lower 90% CI; UCI = upper 90% CI.

Release group	BY	Release group percentage			Harvest		
		Estimate	LCI	UCI	Estimate	LCI	UCI
Dworshak	2008	2.4%	1.3%	3.4%	229	124	335
Dworshak	2009	20.6%	18.2%	23.2%	2,005	1,771	2,252
Dworshak	2010	0.9%	0.4%	1.5%	86	37	148
Cottonwood	2009	1.4%	0.6%	2.3%	134	54	225
Cottonwood	2010	3.1%	2.0%	4.4%	303	191	427
Imnaha	2009	0.6%	0.2%	1.1%	60	24	107
Imnaha	2010	0.3%	0.0%	0.7%	27	0	67
Lyons Ferry	2009	0.8%	0.2%	1.5%	76	24	145
Lyons Ferry	2010	2.8%	1.6%	4.1%	271	156	400
Oxbow	2009	13.6%	11.1%	16.2%	1,320	1,083	1,574
Oxbow	2010	1.0%	0.3%	1.8%	96	25	179
Pahsimeroi	2009	7.1%	5.4%	8.9%	692	525	869
Pahsimeroi	2010	6.7%	5.1%	8.4%	648	492	816
Sawtooth	2009	2.6%	1.7%	3.6%	254	167	354
Sawtooth	2010	8.1%	6.3%	9.9%	783	615	966
SBT_Yankee	2009	0.4%	0.1%	0.7%	36	12	71
SBT_Yankee	2010	2.0%	1.1%	3.0%	199	111	295
Upper Salmon	2008	0.1%	0.0%	0.4%	12	0	36
Wallowa	2009	9.3%	7.2%	11.5%	907	704	1,117
Wallowa	2010	1.6%	0.8%	2.6%	155	73	249
Snake River total		85.3%	84.2%	90.5%	8,294	8,186	8,798
Other	--	14.7%	11.8%	17.6%	1,424	1,143	1,711

Table 18. Percent of female and large fish (fork length ≥ 78 cm) by release group in tribal Zone 6 clipped steelhead harvest. All brood years were combined for this analysis. The percent large all samples column is the percent the total large fish sampled from each release group. The percent large within group column is the percent of large fish within each release group. For example, 85.2% of all large fish came from the Dworshak group and 90.3% of the Dworshak release group were large.

Release group	Actual count					Count expanded for PBT Tag rate			
	Sample size (sex)	Percent female	Sample size (length)	Number of large fish	Percent large within group	Sample size (length)	Number of large fish	Percent large - all samples	Percent large within group
All samples	552	41.5%	400	139	--	400	139	34.8%	--
Dworshak	157	39.5%	124	112	90.3%	131.0	118.4	85.2%	
LF_Cottonwood	22	27.3%	15	1	6.7%	15.2	1.0	0.7%	
Imnaha	6	50.0%	6	0	0.0%	6.3	0.0	0.0%	
Lyons Ferry	15	26.7%	8	0	0.0%	8.0	0.0	0.0%	
Oxbow	61	54.1%	36	5	13.9%	41.1	5.7	4.1%	
Pahsimeroi	78	37.2%	58	5	8.6%	60.5	5.2	3.8%	
Sawtooth	63	30.2%	47	1	2.1%	47.2	1.0	0.7%	
SBT_Yankee	13	46.2%	10	1	10.0%	10.0	1.0	0.7%	
Upper Salmon	1	0.0%	1	1	100.0%	1.0	1.0	0.7%	
Wallowa	49	46.9%	34	1	2.9%	36.9	1.1	0.8%	
All Snake River						357.3	134.4	96.7%	
Other	87	50.6%	61	12	19.7%	42.7	4.6	3.3%	10.8%

Table 19 Actual, expanded, and percent of samples that assigned to Hatchery release groups that was used to estimate the contribution of Snake River hatcheries in the Zone 6 sport fisheries. ns = not sampled.

PBT Assignments												
Fishery	Actual Count				Expanded for Tag rate				Percent of expanded sample			
Release group	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total
<u>Washington shore</u>												
Dworshak	0	2	0	2	0.0	2.1	0.0	2.1	0.0%	2.3%	0.0%	2.3%
Cottonwood	0	3	2	5	0.0	3.1	2.0	5.1	0.0%	3.6%	2.3%	5.8%
Imnaha	0	1	0	1	0.0	1.0	0.0	1.0	0.0%	1.1%	0.0%	1.1%
Lyons Ferry	ns	1	0	1		1.0	0.0	1.0	0.0%	1.2%	0.0%	1.2%
Oxbow	0	20	0	20	0.0	22.9	0.0	22.9	0.0%	26.0%	0.0%	26.0%
Pahsimeroi	0	6	6	12	0.0	6.3	6.2	12.5	0.0%	7.2%	7.0%	14.2%
Sawtooth	1	3	10	14	1.0	3.0	10.1	14.1	1.1%	3.4%	11.4%	16.0%
SBT_Yankee	0	1	0	1	0.0	1.0	0.0	1.0	0.0%	1.1%	0.0%	1.1%
Wallowa	ns	3	1	4		3.3	1.0	4.3	0.0%	3.8%	1.2%	4.9%
Snake River total	1	40	19	60	1.0	43.7	19.3	63.9	1.1%	49.6%	21.9%	72.7%
Other				28				24.1				27.4%
Total	2	80	38	88	2.0	87.4	38.5	88				
<u>Mouth of Deschutes</u>												
Dworshak	0	7	1	8	0	7.2	1.0	8.2	0.0%	10.2%	1.5%	11.7%
Cottonwood	0	0	2	2	0	0.0	2.0	2.0	0.0%	0.0%	2.9%	2.9%
Imnaha	0	2	0	2	0	2.0	0.0	2.0	0.0%	2.9%	0.0%	2.9%
Oxbow	0	10	1	11	0	11.4	1.0	12.5	0.0%	16.3%	1.5%	17.8%
Pahsimeroi	0	7	11	18	0	7.4	11.3	18.7	0.0%	10.5%	16.2%	26.7%
Sawtooth	0	3	7	10	0	3.0	7.0	10.0	0.0%	4.3%	10.1%	14.3%
Wallowa	ns	8	4	12		8.8	4.1	12.9	0.0%	12.6%	5.9%	18.4%
Snake River total	0	37	26	63	0	39.8	26.5	66.3	0.0%	56.8%	37.9%	94.8%
Other				7				3.7				5.3%
Total	0	37	26	70	0	39.8	26.6	70				
<u>John Day Arm</u>												
Dworshak	2	37	6	45	3.0	37.6 ^a	6.2	46.8	2.4%	30.6%	5.0%	38.0%
Cottonwood	0	0	2	2	0	0	2	2.0	0.0%	0.0%	1.6%	1.6%
Imnaha	0	1	0	1	0	1.0	0	1.0	0.0%	0.8%	0.0%	0.8%
Lyons Ferry	ns	1	0	1		1.01	0	1.0	0.0%	0.8%	0.0%	0.8%
Oxbow	0	10	4	14	0	11.4	4.2	15.6	0.0%	9.3%	3.4%	12.7%
Pahsimeroi	0	7	25	32	0	7.34	25.8	33.1	0.0%	6.0%	21.0%	26.9%
Sawtooth	0	1	11	12	0	1.0	11.1	12.1	0.0%	0.8%	9.0%	9.8%
SBT_Yankee	0	4	0	4	0	4.0	0	4.0	0.0%	3.3%	0.0%	3.3%
Wallowa	ns	3	4	7		3.3	4.1	7.4	0.0%	2.7%	3.3%	
Snake River total	2	64	52	118	3.0	66.8	53.3	123	2.4%	54.3%	43.3%	100%
Other				5				0				0%
Total	2	64	52	123	3.0	66.8	53.3	123				

^a Subtract 0.2 from BY09 to keep the sum of the expanded counts equal to the sample size.

Table 20. Estimated release group percentages and 90% bootstrap CIs for the sport fisheries in Zone 6. LCI = lower 90% CI; UCI = upper 90% CI.

Release Group	Washington shore			Mouth of Deschutes			John Day arm		
	Estimate	LCI	UCI	Estimate	LCI	UCI	Estimate	LCI	UCI
<u>Brood Year 2008</u>									
Sawtooth	1.1%	0.0%	3.4%	0.0%			0.0%		
Dworshak	0.0%			0.0%			2.4%	0.0%	6.0%
<u>Brood Year 2009</u>									
Dworshak	2.3%	0.0%	5.8%	10.2%			30.8%	24.1%	37.5%
Cottonwood	3.6%	1.2%	7.1%	0.0%			0.0%		
Imnaha	1.1%	0.0%	3.4%	2.9%	0.0%	5.7%	0.8%	0.0%	2.4%
Lyons Ferry	1.1%	0.0%	3.4%	0.0%			0.8%	0.0%	2.5%
Oxbow	26.0%	18.2%	35.1%	16.3%	8.2%	24.5%	9.3%	4.7%	13.9%
Pahsimeroi	7.2%	2.4%	12.0%	10.5%	4.5%	16.6%	6.0%	2.6%	9.4%
Sawtooth	3.4%	1.1%	6.8%	4.3%	1.4%	8.6%	0.8%	0.0%	2.4%
SBT_Yankee	1.1%	0.0%	3.4%	0.0%			3.3%	0.8%	5.7%
Wallowa	3.7%	0.0%	7.5%	12.6%	6.3%	20.4%	2.7%	0.9%	5.4%
<u>Brood Year 2010</u>									
Dworshak	0.0%			1.5%	0.0%	4.4%	5.0%	1.7%	8.4%
Cottonwood	2.3%	0.0%	5.7%	2.9%	0.0%	5.7%	1.6%	0.0%	4.1%
Oxbow	0.0%			1.5%	0.0%	4.5%	3.4%	0.9%	5.9%
Pahsimeroi	7.0%	2.3%	11.7%	16.2%	8.8%	23.6%	21.0%	15.1%	26.8%
Sawtooth	11.4%	5.7%	17.1%	10.0%	4.3%	15.8%	9.0%	4.9%	13.9%
Wallowa	1.2%	0.0%	3.5%	5.9%	1.5%	10.2%	3.3%	8.3%	3.2%
<u>No Brood Year assignment</u>									
Other	27.3%	18.6%	36.1%	5.3%	0.0%	11.8%	0.0%		

Table 21. The estimated release and reporting group percentages and 90% bootstrap CIs in the tribal Drano Lake fishery in 2012. LCI = lower 90% CI; UCI = 90% upper CI.

Group	Brood Year	Estimate	LCI	UCI
<u>Clipped fish</u>				
Dworshak	2008	3.6%	0.0%	10.8%
Dworshak	2009	47.4%	34.9%	59.9%
Cottonwood	2010	2.4%	0.0%	7.3%
Imnaha	2009	2.4%	0.0%	7.3%
Oxbow	2009	2.8%	0.0%	8.4%
Pahsimeroi	2009	7.7%	2.6%	15.4%
Sawtooth	2009	2.4%	0.0%	7.3%
Wallowa	2009	10.7%	2.7%	18.8%
Wallowa	2010	2.5%	0.0%	7.5%
<i>Snake River clipped groups</i>		82.1%	70.4%	93.0%
Other clipped fish	--	17.9%	7.0%	29.6%
<u>Unclipped fish</u>				
<u>Hatchery groups</u>				
Dworshak	2009	8.7%	3.5%	15.6%
Oxbow	2009	3.9%	0.0%	7.7%
Wallowa	2009	1.9%	0.0%	5.6%
<i>Snake River unclipped hatchery groups</i>		14.4%	6.8%	20.3%
<u>GSI groups</u>				
KLICKR	--	11.9%	5.1%	18.6%
LOWCOL	--	3.4%	0.0%	6.8%
MGILCS	--	55.6%	45.1%	65.9%
SFCLWR	--	4.9%	1.4%	10.0%
UPCLWR	--	3.4%	0.0%	6.8%
UPPCOL	--	3.4%	0.0%	6.8%
UPSALM	--	1.4%	0.0%	4.8%
WILLAM	--	1.7%	0.0%	5.1%
<i>All GSI groups</i>		85.6%	78.0%	93.2%

Table 22. The number of PBT assignments, expanded assignments, and the percentage of each hatchery release group and brood year used to estimate lower Snake River sport harvest from September 1, 2012 to March 31, 2013.

Release group	PBT Assignments								Percent of expanded samples			
	Actual Count				Expanded for Tag rate							
	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total
Cottonwood	1	4	4	9	1.0	4.2	4.0	9.2	0.2%	0.7%	0.6%	1.5%
Dworshak	6	134	8	148	8.9	137.1	8.3	154.2	1.4%	21.6%	1.3%	24.3%
Imnaha	0	4	0	4	0.0	4.0	0.0	4.0	0.0%	0.6%	0.0%	0.6%
Lyons Ferry	ns	69	167	236		69.7	167.0	236.7		11.0%	26.3%	37.3%
Oxbow	0	21	6	27	0.0	24.0	6.3	30.3	0.0%	3.8%	1.0%	4.8%
Pahsimeroi	0	22	60	82	0.0	23.2	61.8	85.0	0.0%	3.7%	9.8%	13.4%
Sawtooth	0	12	39	51	0.0	12.0	39.2	51.2	0.0%	1.9%	6.2%	8.1%
SBT_Yankee	0	0	10	10	0.0	0.0	10.0	10.0	0.0%	0.0%	1.6%	1.6%
Wallowa	ns	31	14	45		34.1	14.3	48.4		5.4%	2.3%	7.6%
Snake River total:	7	297	308	612	9.9	308.2	310.9	629.0	1.6%	48.6%	49.0%	99.2%
Other (non-Snake hatchery)				22				5.0				0.8%

Table 23. Estimated release group percentages, harvest contribution, and 90% confidence intervals in the Lower Snake River sport fishery from September 1, 2012 to March 31, 2013.

Release group	BY	Release group percentage			Harvest		
		Estimate	LCI	UCI	estimate	LCI	UCI
Cottonwood	2008	0.2%	0.0%	0.5%	12	0	35
Cottonwood	2009	0.7%	0.2%	1.3%	47	12	94
Cottonwood	2010	0.6%	0.2%	1.3%	45	11	90
Dworshak	2009	1.4%	0.5%	2.3%	100	33	167
Dworshak	2008	21.6%	18.9%	24.4%	1,548	1,352	1,744
Dworshak	2009	1.3%	0.7%	2.1%	93	47	152
Imnaha	2010	0.6%	0.2%	1.3%	45	11	90
Lyons Ferry	2009	11.0%	8.9%	13.1%	787	638	935
Lyons Ferry	2010	26.3%	23.5%	29.2%	1,886	1,683	2,089
Oxbow	2009	3.8%	2.5%	5.2%	271	181	374
Oxbow	2010	1.0%	0.3%	1.6%	71	24	118
Pahsimeroi	2009	3.7%	2.5%	5.0%	262	179	357
Pahsimeroi	2010	9.8%	7.8%	11.9%	698	559	850
Sawtooth	2009	1.9%	1.1%	2.8%	136	79	203
Sawtooth	2010	6.2%	4.6%	7.8%	443	329	556
SBT_Yankee	2010	1.6%	0.8%	2.4%	113	56	169
Wallowa	2009	5.4%	3.8%	6.9%	385	273	497
Wallowa	2010	2.3%	1.3%	3.2%	162	93	231
Other	--	0.8%	0.0%	2.2%	56	0	154

Table 24. Percent of female and large fish (fork length ≥ 78 cm) by release group in the lower Snake River sport harvest. All brood years were combined for this analysis. The percent large - all samples column is the percent the total large fish sampled from each release group. The percent large within group column is the percent of large fish within each release group. For example, 3.8% of all large fish came from the Oxbow group and 18.5% of the Oxbow release group were large.

Release group	Actual Count					Count expanded for PBT Tag rate			
	Sample size (sex)	Percent female	Sample size (length)	Number of large fish	Percent large within group	Sample size (length)	Expected number of large fish	Percent large - all samples	Percent large within group
All samples	631	46.4%	634	146	--	634	146	23.0%	--
Cottonwood	9	44.4%	9	1	11.1%	9.2	1.02	0.7%	
Dworshak	148	45.3%	148	125	84.5%	154.2	130.26	87.2%	
Imnaha	4	100.0%	4	0	0.0%	4.0	0.00	0.0%	
Lyons Ferry	234	49.1%	236	4	1.7%	236.7	4.01	2.7%	
Oxbow	27	37.0%	27	5	18.5%	30.3	5.60	3.8%	
Pahsimeroi	81	42.0%	82	2	2.4%	85.0	2.07	1.4%	
Sawtooth	51	49.0%	51	1	2.0%	51.2	1.00	0.7%	
SBT_Yankee	10	30.0%	10	0	0.0%	10.0	0.00	0.0%	
Wallowa	45	46.7%	45	5	11.1%	48.4	5.38	3.6%	
All Snake River						629.0	149.36		
Other ^a	22	45.5%	22	3		5.0	-3.36	0%	0%

^a After expanding all Snake River release groups by the PBT tag rate and calculating the number of expected large fish there were more expected large fish than what was sampled (149.36 expected versus 146 sampled) hence we set the percent of large fish in the Other group to 0% for all samples and within the Other group. We used the sum of the expected number of large fish to calculate the total large percentage from each release group (for example, the percent large all samples in the Dworshak group was 130.26 / 149.36).

Table 25. Actual, expanded, adjusted, and percent of samples that assigned to hatchery (above dashed line) release groups and GSI (below dashed line) reporting groups that were used to estimate the unclipped harvest contribution in the Tribal Zone 6 fishery from August 1 to August 20, 2012. Sample size was 73 fish. ns = not sampled.

Group	Actual Count			Expanded Count			Adjusted Count			Percent of samples		
	BY09	BY10	Total	BY09	BY10	Total	BY09	BY10	Total	BY09	BY10	Total
Dworshak	4	0	4	4.1	0.0	4.1	4.1	0.0	4.1	5.6%	0.0%	5.6%
LF_Tucannon	1	0	1	1.1	0.0	1.1	1.1	0.0	1.1	1.6%	0.0%	1.6%
Imnaha	0	1	1	0.0	1.1	1.1	0.0	1.1	1.1	0.0%	1.6%	1.6%
Oxbow	2	0	2	2.3	0.0	2.3	2.3	0.0	2.3	3.1%	0.0%	3.1%
Pahsimeroi	2	1	3	2.1	1.0	3.1	2.1	1.0	3.1	2.9%	1.4%	4.3%
Sawtooth	0	1	1	0.0	1.0	1.0	0.0	1.0	1.0	0.0%	1.4%	1.4%
SBT_Yankee	1	0	1	1.0	0.0	1.0	1.0	0.0	1.0	1.4%	0.0%	1.4%
Wallowa	1	0	1	1.1	0.0	1.1	1.1	0.0	1.1	1.5%	0.0%	1.5%
<i>Hatchery total:</i>	<i>11</i>	<i>3</i>	<i>14</i>	<i>11.7</i>	<i>3.2</i>	<i>14.9</i>	<i>11.7</i>	<i>3.2</i>	<i>14.9</i>	<i>16.1%</i>	<i>4.3%</i>	<i>20.4%</i>
BWSALM			1						1.0			1.4%
KLICKR			1						1.0			1.4%
MFSALM			3						3.0			4.1%
MGILCS			42						41.5			56.9%
SKAMAN			2						2.0			2.7%
UPCLWR			1						1.0			1.3%
UPPCOL			3						2.9			4.0%
UPSALM			5						4.7			6.4%
YAKIMA			1						1.0			1.4%
GSI total			59						58.1			79.6%

Table 26. Estimated release and reporting group percentages, 90% bootstrap CIs, and harvest contribution for the tribal Zone 6 unclipped steelhead harvest from August 1 to August 20 and from August 21 to November 10, 2012. LCI = lower 90% CI; UCI = upper 90% CI. Hatchery groups are above the dashed line.

Group	BY	August 1 to August 20						August 21 to November 10						Total Harvest		
		Estimate	LCI	UCI	Harvest estimate	Harvest LCI	Harvest UCI	Estimate	LCI	UCI	Harvest estimate	Harvest LCI	Harvest UCI	Harvest estimate	Harvest LCI	Harvest UCI
Dworshak	2008	0.0%			0			1.5%	0.4%	2.9%	53	13	106	53	13	106
Dworshak	2009	5.6%	1.4%	9.8%	105	26	185	15.0%	12.2%	18.0%	541	440	651	646	512	788
Dworshak	2010	0.0%			0			0.3%	0.0%	0.8%	9	0	28	9	0	28
EF_Sawtooth	2009	0.0%			0			0.7%	0.0%	1.5%	27	0	54	27	0	54
EF_Sawtooth	2010	0.0%			0			0.2%	0.0%	0.7%	9	0	27	9	0	27
LF_Tucannon	2009	1.6%	0.0%	4.7%	29	0	88	0.6%	0.0%	1.1%	20	0	41	49	0	109
LF_Tucannon	2010	0.0%			0			1.1%	0.4%	2.1%	39	13	77	39	13	77
Imnaha	2010	1.6%	0.0%	4.7%	29	0	87	0.3%	0.0%	0.8%	10	0	30	39	0	98
Lyons Ferry	2009	0.0%			0			0.3%	0.0%	0.8%	9	0	27	9	0	27
Lyons Ferry	2010	0.0%			0			0.2%	0.0%	0.7%	9	0	27	9	0	27
Oxbow	2009	3.1%	0.0%	7.8%	59	0	119	0.9%	0.3%	1.7%	31	10	61	90	20	169
Pahsimeroi	2009	2.9%	0.0%	5.8%	54	0	136	0.8%	0.3%	1.6%	28	9	57	82	19	156
Pahsimeroi	2010	1.4%	0.0%	4.2%	27	0	80	0.8%	0.3%	1.5%	28	9	55	55	9	109
Sawtooth	2010	1.4%	0.0%	4.1%	26	0	78	0.2%	0.0%	0.7%	9	0	27	35	0	87
SBT_Yankee	2009	1.4%	0.0%	4.1%	26	0	78	1.5%	0.5%	2.5%	54	18	90	80	27	140
SBT_Yankee	2010	0.0%			0			1.0%	0.2%	2.0%	36	9	72	36	9	72
Upper Salmon	2010	0.0%			0			0.8%	0.3%	1.6%	28	9	56	28	9	56
Wallowa	2009	1.5%	0.0%	4.5%	28	0	85	0.8%	0.0%	1.6%	30	0	59	58	10	116
<i>Hatchery total:</i>		20.4%	12.9%	28.9%	383	243	544	26.8%	23.1%	30.6%	970	834	1,107	1,353	1,150	1,564
BWSALM		1.4%	0.0%	4.1%	26	0	77	0.2%	0.0%	0.7%	9	0	27	35	0	86
Klickr		1.4%	0.0%	4.1%	26	0	77	1.0%	0.2%	1.7%	36	9	63	62	18	121
MFSALM		4.1%	1.4%	8.2%	77	26	155	2.5%	1.2%	3.7%	90	45	134	167	89	254
MGILCS		56.9%	47.0%	66.7%	1,070	886	1,252	46.1%	41.8%	50.2%	1,663	1,509	1,812	2,733	2,495	2,970
SFCLWR		0.0%			0			4.7%	3.0%	6.5%	170	107	233	170	107	233
SFSALM		0.0%			0			3.0%	1.7%	4.5%	108	63	161	108	63	161
SKAMAN		2.7%	0.0%	6.8%	52	0	103	0.5%	0.0%	1.2%	18	0	45	70	9	139
UPCLWR		1.3%	0.0%	4.0%	25	0	76	5.8%	3.8%	7.8%	209	137	282	234	154	321
UPPCOL		4.0%	1.1%	8.2%	75	21	153	4.3%	2.7%	6.1%	157	97	220	232	142	334
UPSALM		6.4%	2.1%	11.9%	121	41	222	4.1%	2.5%	5.8%	146	91	209	267	165	382
YAKIMA		1.4%	0.0%	4.1%	26	0	77	1.0%	0.2%	1.7%	36	9	63	62	18	121
<i>GSI total</i>		79.6%	71.1%	87.1%	1,498	1,338	1,639	73.2%	69.4%	76.9%	2,642	2,505	2,778	4,140	3,929	4,343
Grand total					1,881						3,612			5,493		

Table 27. Actual, expanded, adjusted, and percent of samples that assigned to hatchery (above dashed line) release groups and GSI (below dashed line) reporting groups that were used to estimate the unclipped harvest contribution in the Tribal Zone 6 fishery from August 21 to November 10, 2012. Sample size was 403 fish. ns = not sampled. The sum of the expanded BY columns may not equal the total column due to rounding error.

Group	Actual Count				Expanded count				Adjusted count				Percent of samples			
	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total	BY08	BY09	BY10	Total
Dworshak	4	59	1	64	5.9	60.4	1.0	67.3	5.9	60.4	1.0	67.3	1.5%	15.0%	0.3%	16.7%
EF_Sawtooth	0	3	1	4		3.0	1.0	4.0		3.0	1.0	4.0		0.7%	0.2%	1.0%
LF_Tucannon	ns	2	3	5		2.3	4.3	6.6		2.3	4.3	6.6		0.6%	1.1%	1.6%
Imnaha	0	0	1	1		0.0	1.1	1.1		0.0	1.1	1.1		0.0%	0.3%	0.3%
Lyons Ferry	ns	1	1	2		1.0	1.0	2.0		1.0	1.0	2.0		0.3%	0.2%	0.5%
Oxbow	0	3	0	3		3.4	0.0	3.4		3.4	0.0	3.4		0.9%	0.0%	0.9%
Pahsimeroi	0	3	3	6		3.2	3.1	6.3		3.2	3.1	6.3		0.8%	0.8%	1.6%
Sawtooth	0	0	1	1		0.0	1.0	1.0		0.0	1.0	1.0		0.0%	0.2%	0.2%
SBT_Yankee	0	6	4	10		6.0	4.0	10.0		6.0	4.0	10.0		1.5%	1.0%	2.5%
Upper Salmon	0	0	3	3		0.0	3.1	3.1		0.0	3.1	3.1		0.0%	0.8%	0.8%
Wallowa	ns	3	0	3		3.3	0.0	3.3		3.3	0.0	3.3		0.8%	0.0%	0.8%
<i>Hatchery total:</i>	<i>4</i>	<i>80</i>	<i>18</i>	<i>102</i>	<i>5.9</i>	<i>82.5</i>	<i>19.7</i>	<i>108.2</i>	<i>5.9</i>	<i>82.5</i>	<i>19.7</i>	<i>108.2</i>	<i>1.5%</i>	<i>20.5%</i>	<i>4.9%</i>	<i>26.8%</i>
<hr/>																
BWSALM				1								1.0				0.2%
KLICKR				4								4.0				1.0%
MFSALM				10								10.0				2.5%
MGILCS				189								187.2				46.4%
SFCLWR				19								15.9				3.9%
SFSALM				12								12.0				3.0%
SKAMAN				2								2.0				0.5%
UPCLWR				25								25.0				6.2%
UPPCOL				18								17.5				4.3%
UPSALM				17								16.3				4.1%
YAKIMA				4								4.0				1.0%
<i>GSI total:</i>				<i>301</i>								<i>294.8</i>				<i>73.2%</i>

Table 28. Estimated release and reporting group percentages, 90% bootstrap CIs, and harvest contribution for the total tribal Zone 6 unclipped steelhead harvest from August 1 to November 10, 2012. LCI = lower 90% CI; UCI = upper 90% CI. The hatchery release groups identified with PBT are above the dashed line and the GSI reporting groups are below the dashed line. Total unclipped harvest was 5,493 fish.

Group	BY	Estimate	LCI	UCI	Harvest estimate	Harvest LCI	Harvest UCI
Dworshak	2008	1.0%	0.2%	1.5%	53	12	81
Dworshak	2009	11.8%	8.1%	14.4%	646	442	793
Dworshak	2010	0.2%	0.0%	0.4%	9	0	24
EF_Sawtooth	2009	0.5%	0.1%	0.9%	27	8	47
EF_Sawtooth	2010	0.2%	0.0%	0.4%	9	0	23
LF_Tucannon	2009	0.9%	0.0%	2.3%	49	0	124
LF_Tucannon	2010	0.7%	0.2%	1.2%	39	11	68
Imnaha	2010	0.7%	0.0%	2.1%	39	0	114
Lyons Ferry	2009	0.2%	0.0%	0.4%	9	0	24
Lyons Ferry	2010	0.2%	0.0%	0.4%	9	0	23
Oxbow	2009	1.6%	0.3%	3.6%	90	18	199
Pahsimeroi	2009	1.5%	0.0%	3.4%	82	0	185
Pahsimeroi	2010	1.0%	0.1%	2.3%	55	8	128
Sawtooth	2010	0.6%	0.0%	1.9%	35	0	102
SBT_Yankee	2009	1.5%	0.3%	2.8%	80	16	156
SBT_Yankee	2010	0.7%	0.1%	1.1%	36	8	63
Upper Salmon	2010	0.5%	0.0%	0.9%	28	0	49
Wallowa	2009	1.1%	0.2%	2.6%	58	9	145
All hatchery groups:		24.6%	20.9%	28.5%	1,353	1,150	1,564
BWSALM		0.6%	0.0%	1.8%	35	0	100
Klickr		1.1%	0.9%	3.8%	62	47	210
MFSALM		3.0%	0.0%	0.6%	167	0	31
MGILCS		49.8%	1.2%	4.9%	2,733	65	272
SFCLWR		3.1%	44.6%	56.4%	170	2,452	3,100
SFSALM		2.0%	2.1%	4.3%	108	117	234
SKAMAN		1.3%	1.0%	2.6%	70	55	141
UPCLWR		4.3%	0.0%	2.6%	234	0	142
UPPCOL		4.2%	2.5%	6.2%	232	135	341
UPSALM		4.9%	2.2%	6.7%	267	119	365
YAKIMA		1.1%	2.2%	7.5%	62	122	412
All GSI groups:		75.4%	71.5%	79.1%	4,140	3,929	4,343
Total harvest					5,493		

Table 29. Percent of female and large fish (fork length ≥ 78 cm) by release group in tribal Zone 6 unclipped steelhead harvest. All brood years were combined for this analysis. The percent large - all samples column is the percent the total large fish sampled from each release group. The percent large within group column is the percent of large fish within each release group. For example, 31.3% of all large fish came from the Dworshak group and 93.0% of the Dworshak release group were large. The hatchery release groups identified with PBT are above the dashed line. GSI reporting groups are between the dashed lines.

Release group	Sample size (sex)	Percent female	Sample size (length)	Number of large fish	Percent large - all samples	Percent large within group
All samples	370	54.9%	239	99	41.4%	--
Dworshak	62	45.2%	38	35	35.4%	92.1%
EF_Sawtooth	4	75.0%	3	0	0.0%	0.0%
LF_Tucannon	4	75.0%	3	0	0.0%	0.0%
Imnaha	1	0.0%	0	0	0.0%	0.0%
Lyons Ferry	2	100.0%	1	0	0.0%	0.0%
Oxbow	3	33.3%	1	0	0.0%	0.0%
Pahsimeroi	6	50.0%	3	0	0.0%	0.0%
Sawtooth	1	0.0%	0	0	0.0%	0.0%
SBT_Yankee	10	60.0%	5	0	0.0%	0.0%
Upper Salmon	3	33.3%	1	0	0.0%	0.0%
Wallowa	3	33.3%	1	0	0.0%	0.0%
BWSALM	1	100.0%	0	0	0.0%	0.0%
KLICKR	3	66.7%	1	0	0.0%	0.0%
MFSALM	8	75.0%	4	2	2.0%	50.0%
MGILCS	171	56.1%	109	22	22.2%	20.2%
SFCLWR	17	52.9%	14	13	13.1%	92.9%
SFSALM	12	75.0%	11	6	6.1%	54.5%
SKAMAN	2	100.0%	0	0	0.0%	0.0%
UPCLWR	24	58.3%	21	18	18.2%	85.7%
UPPCOL	16	43.8%	13	3	3.0%	23.1%
UPSALM	14	57.1%	7	0	0.0%	0.0%
YAKIMA	3	33.3%	3	0	0.0%	0.0%

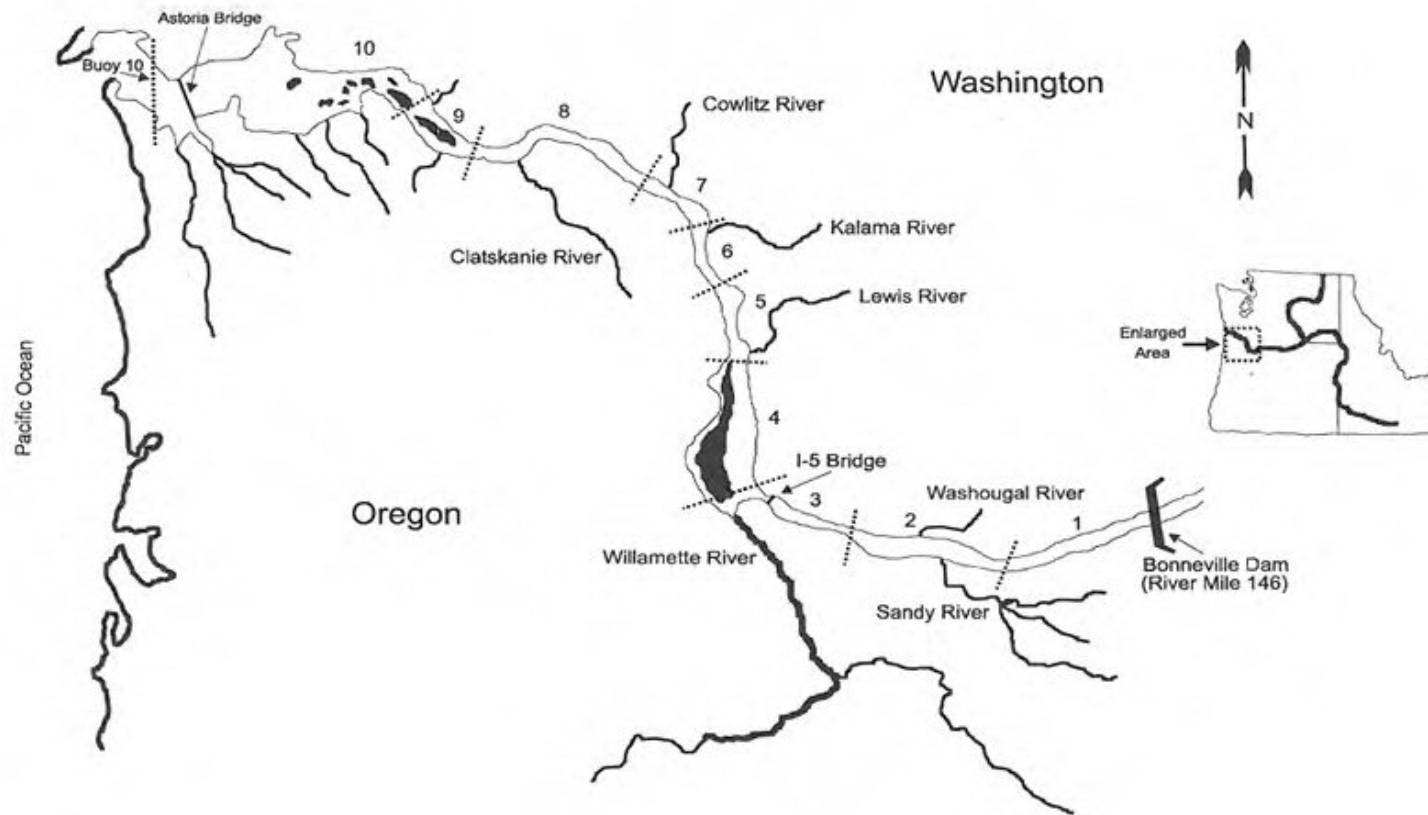


Figure 1. Map of the Columbia River, downstream of Bonneville Dam, showing the sport fishing sections used for creel surveys.

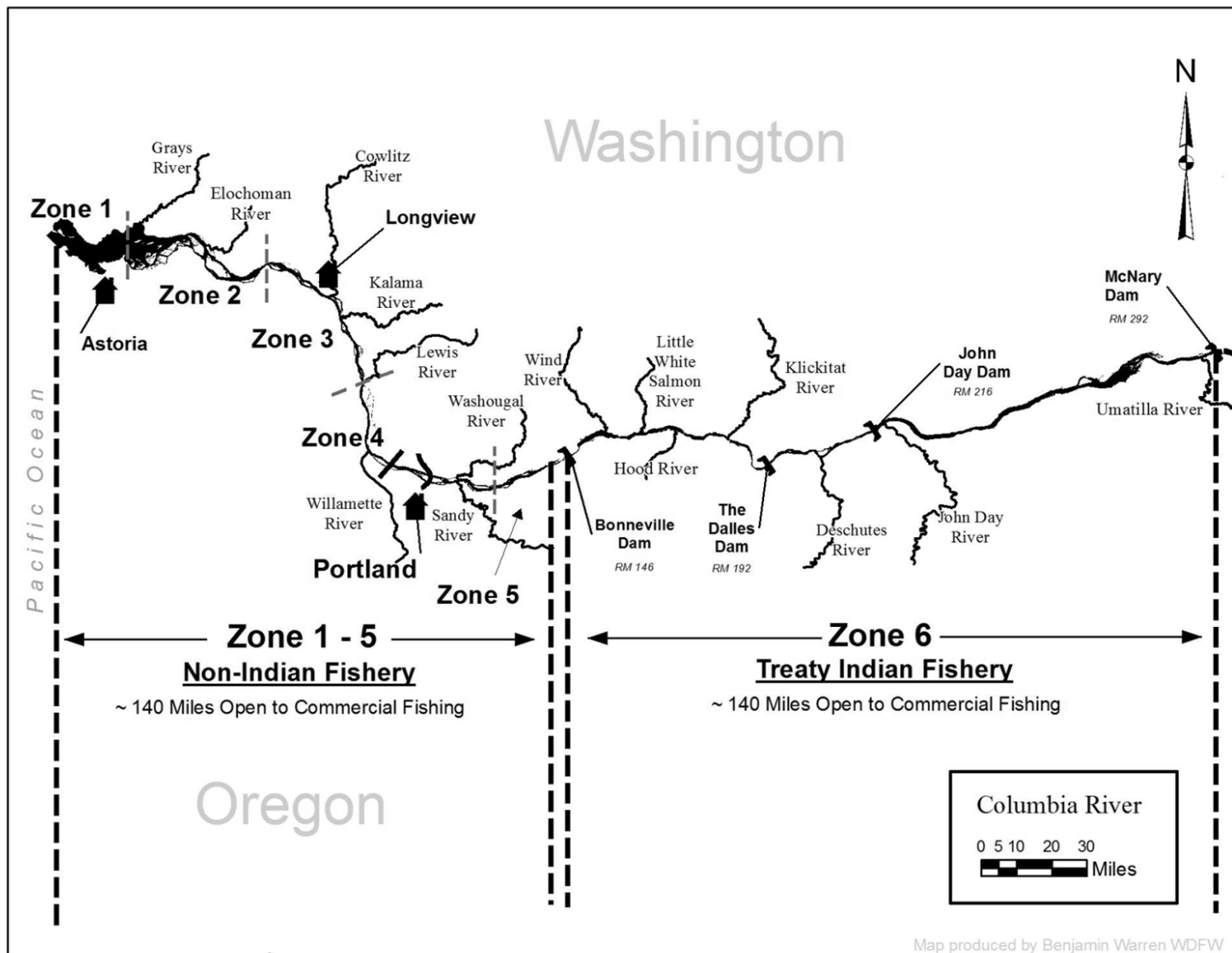


Figure 2. Map of the Columbia River, downstream of McNary Dam, showing the commercial fishing areas.

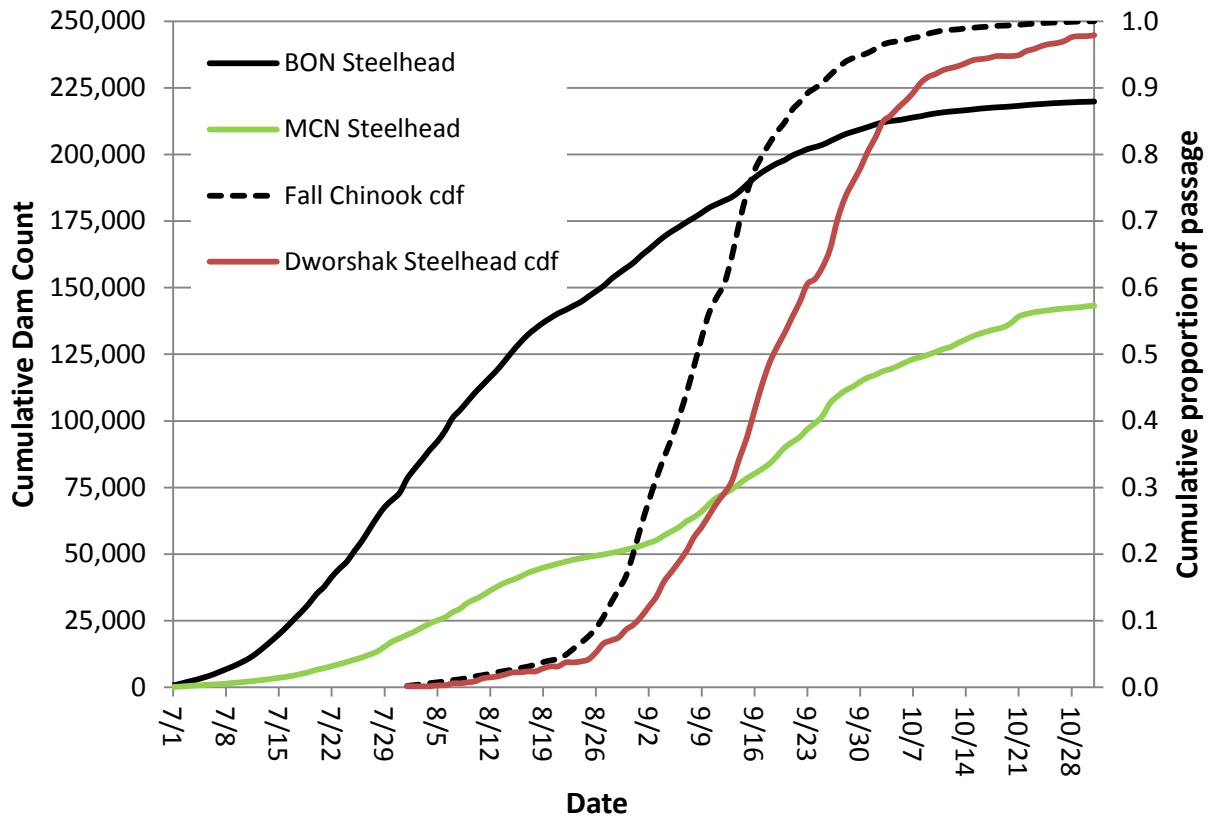


Figure 3. Total cumulative steelhead passage at Bonneville Dam (BON) and McNary Dam (MCN) from July 1 to October 31, 2102 on the left y-axis. The cumulative proportion of passage of the Dworshak stock steelhead and Fall Chinook at Bonneville Dam is shown on the right y-axis. The total count of adult Fall Chinook at Bonneville Dam from August 1 to October 31 was 349,348.

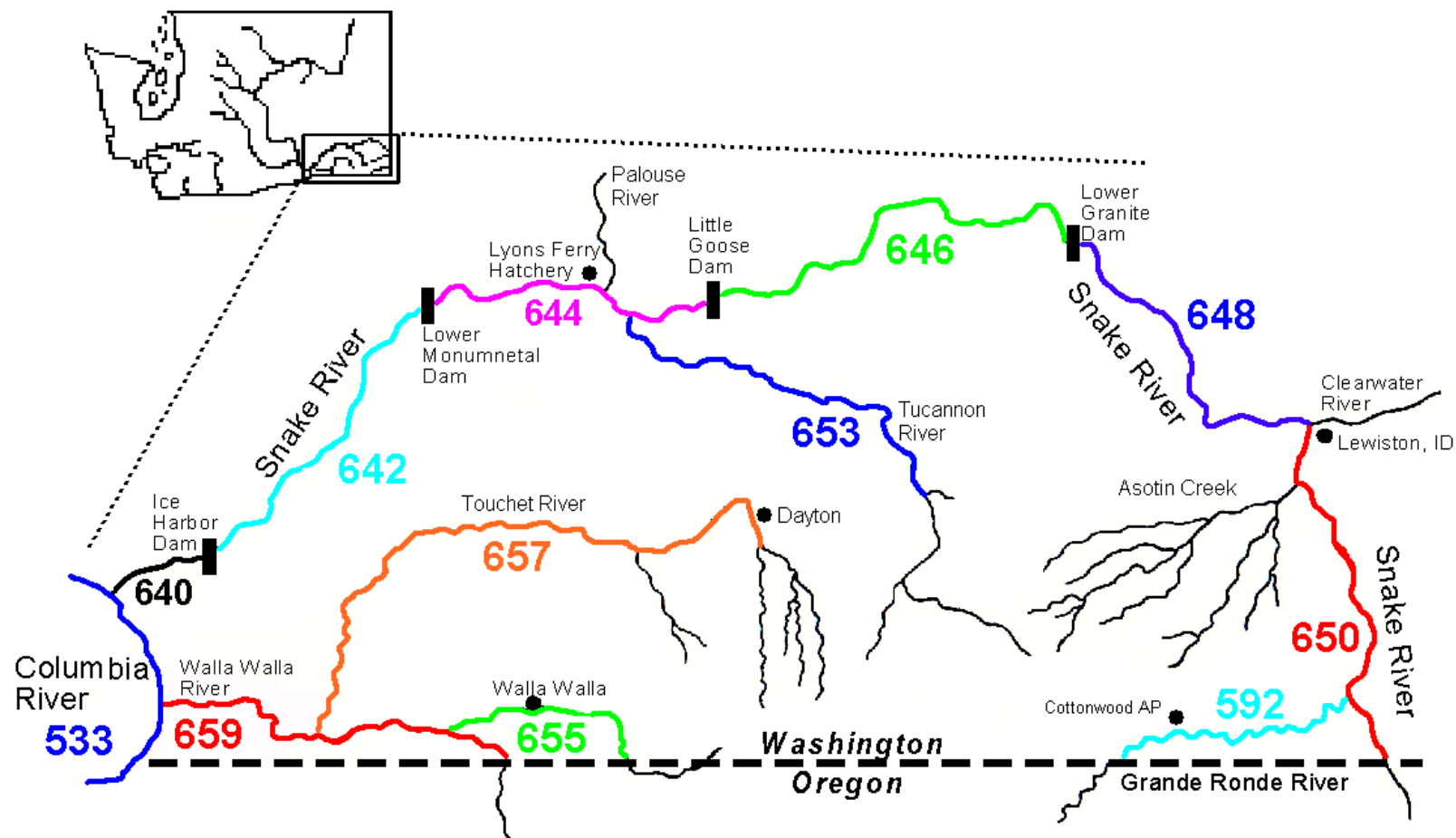


Figure 4. Map of the lower Snake River showing boundaries of the sections used to estimate monthly steelhead harvest.

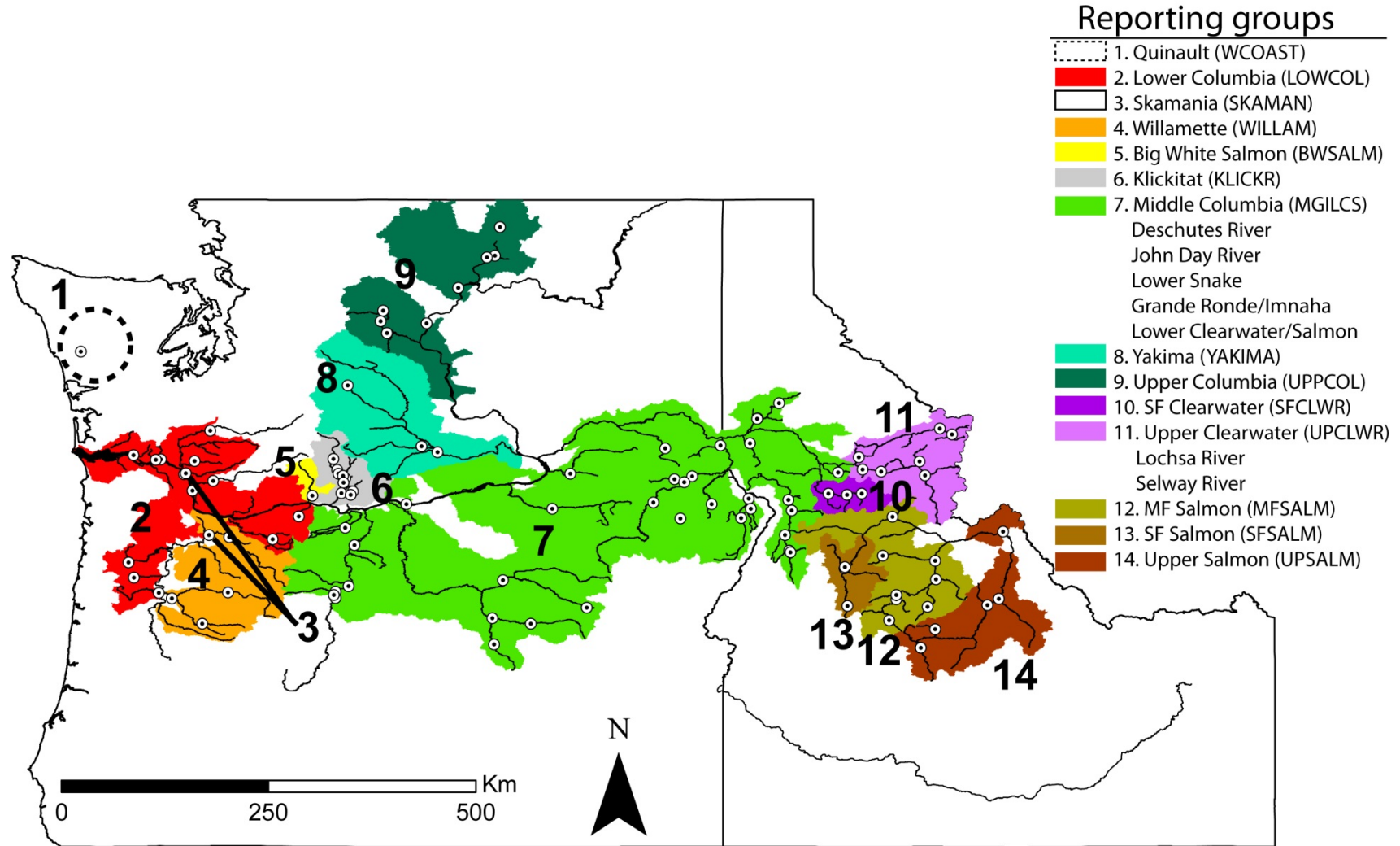


Figure 5. Map showing the GSI reporting groups that have been developed by CRITFC. These groups were used to assign unclipped steelhead that were not identified with PBT.

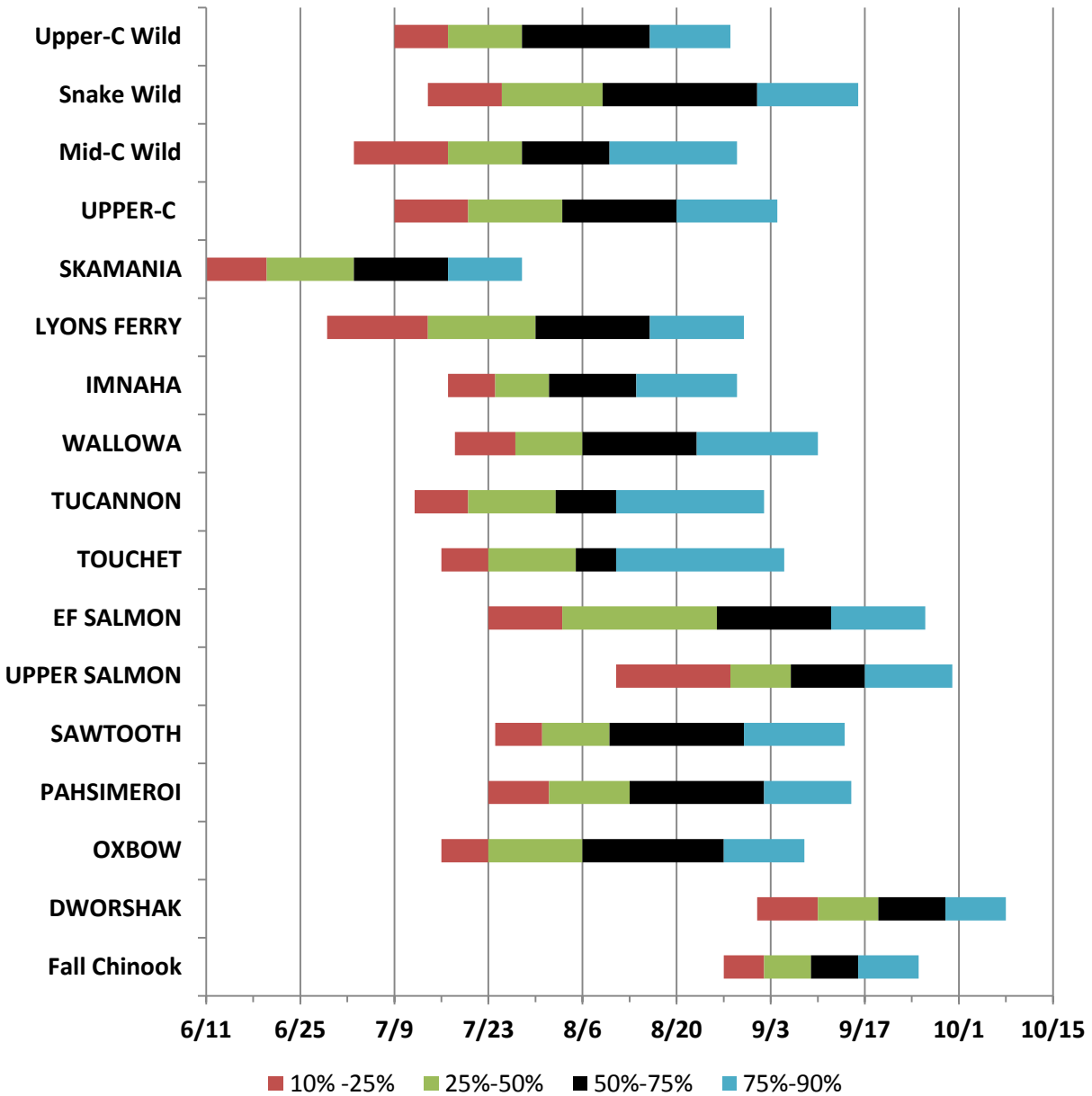


Figure 6. Arrival quantiles of Fall Chinook, Snake River and Upper Columbia River steelhead hatchery stocks (in upper case), wild steelhead from the Snake, Mid-Columbia (Mid-C, Bonneville Dam to Yakima River), and Upper Columbia (Upper-C, upstream of the Yakima River) regions at Bonneville Dam in 2012. UPPER-C is all hatchery stocks upstream of the Yakima River combined. The Skamania stock run-timing is for fish released in the Klickitat River only. Wild run-timing was calculated by combining all adult detections from all release sites in each region.

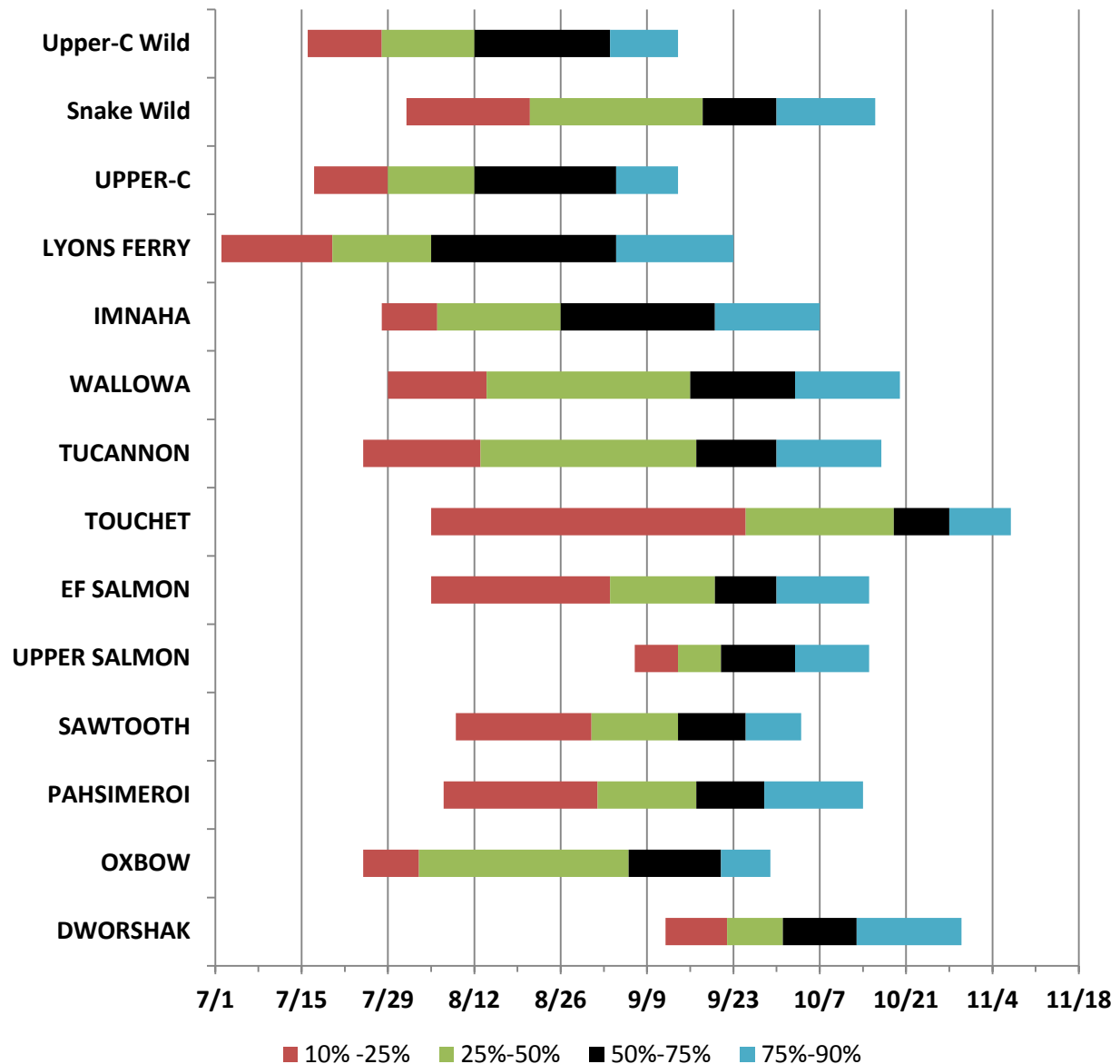


Figure 7. Arrival quantiles of Snake River and Upper Columbia River hatchery (in upper case) and wild steelhead stocks at McNary Dam in 2012. UPPER-C is all hatchery stocks upstream of the Yakima River combined. Wild run-timing was calculated by combining all adult detections from all release sites in the two regions.

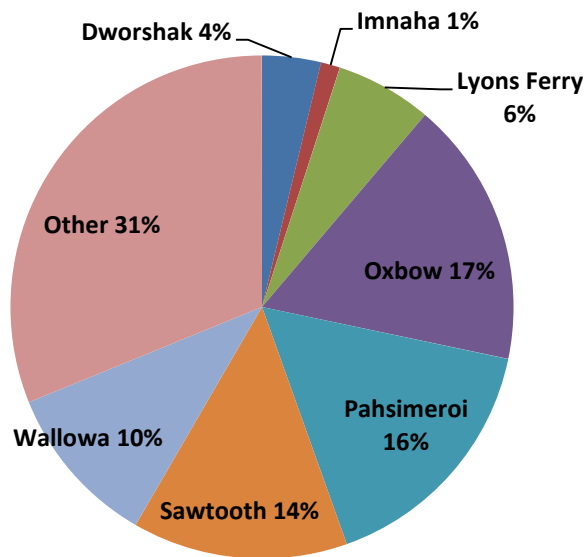


Figure 8. Contribution to sport harvest by hatchery stock in the lower Columbia River from July 1 to October 31, 2012.

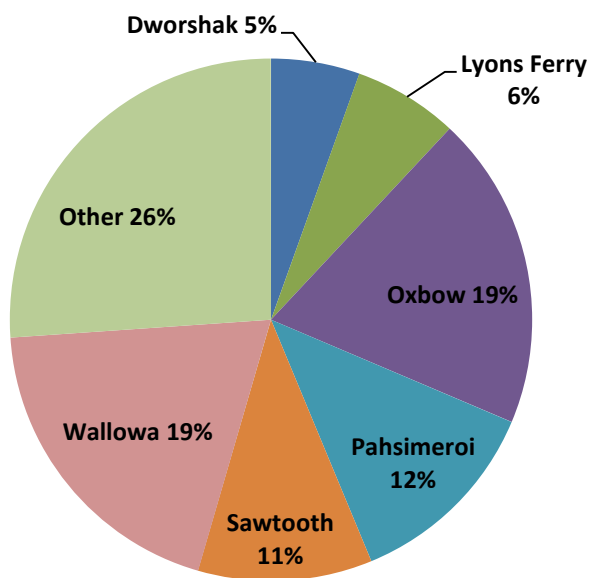


Figure 9. Contribution to tribal Zone 6 clipped steelhead harvest by hatchery stock from August 1 to August 20, 2012.

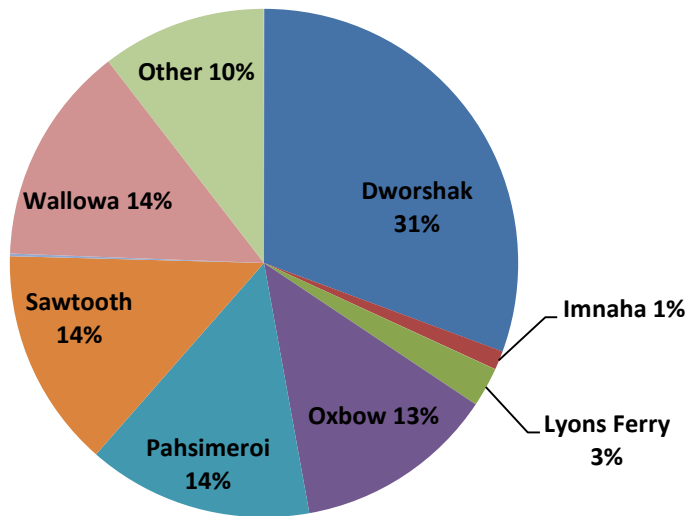


Figure 10. Contribution to tribal Zone 6 clipped steelhead harvest by hatchery stock from August 21 to November 10, 2012.

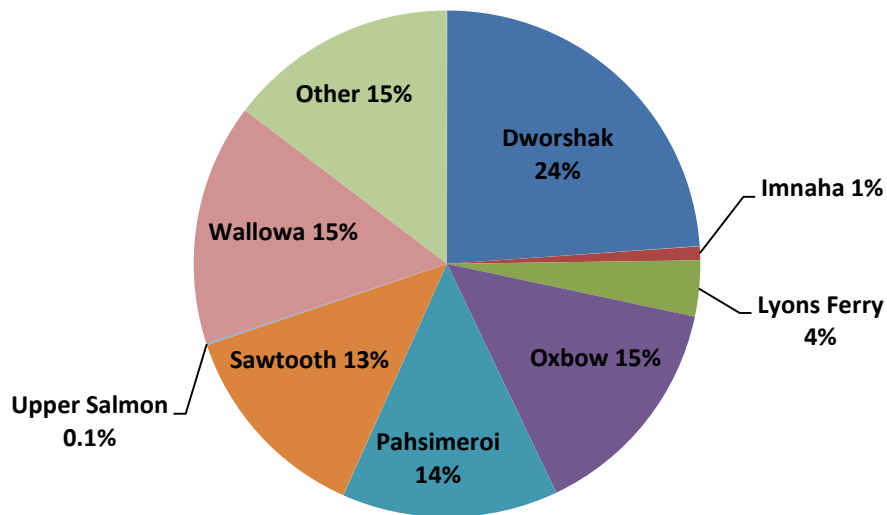


Figure 11. Contribution to tribal Zone 6 clipped steelhead harvest by hatchery stock from August 1 to November 10, 2012.

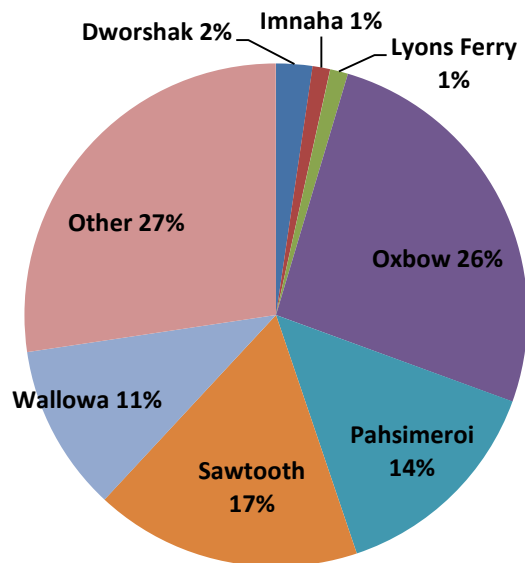


Figure 12. The estimated percentage of hatchery stocks in the Washington shore 2012 sport fishery in Zone 6.

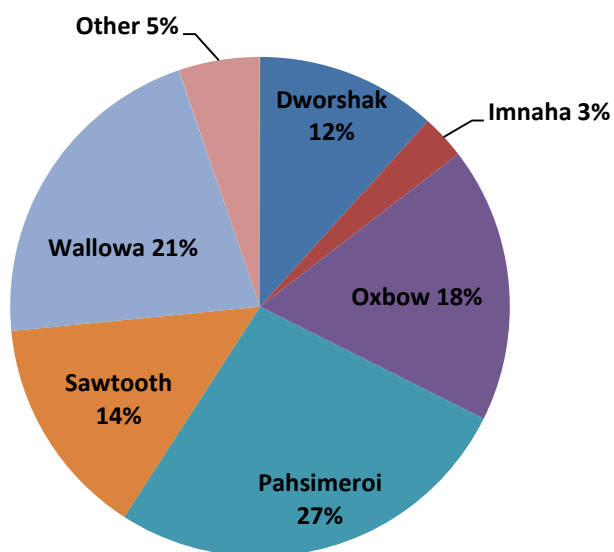


Figure 13. The estimated percentage of hatchery stocks in the mouth of the Deschutes 2012 sport fishery in Zone 6.

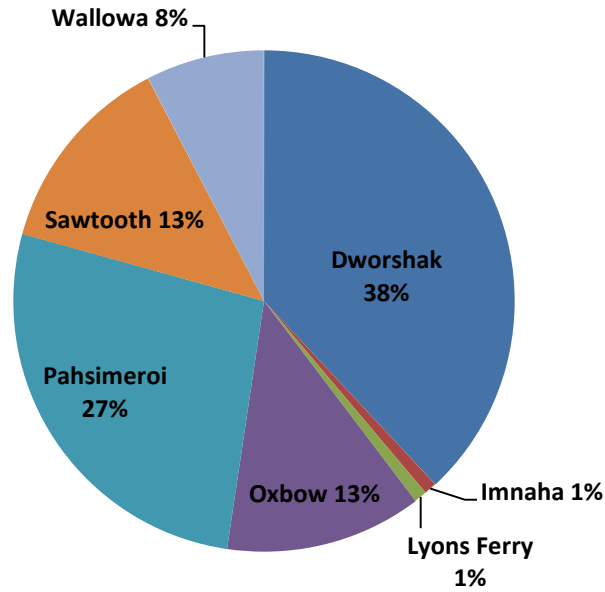


Figure 14. The estimated percentage of hatchery stocks in the 2012 John Day Arm sport fishery in Zone 6.

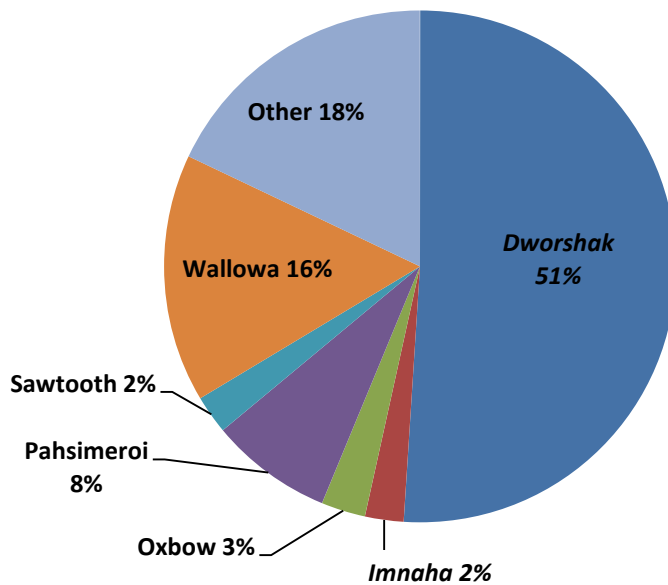


Figure 15. The estimated percentage of hatchery stocks in the tribal Drano Lake clipped steelhead harvest in 2012.

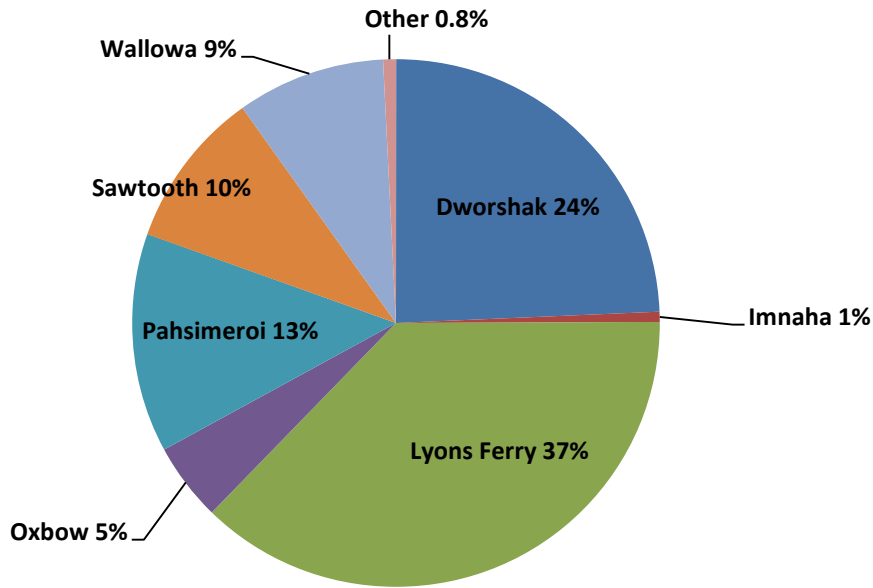


Figure 16. The estimated stock composition in the lower Snake River sport fishery from September 1 , 2012 to March 31, 2013.

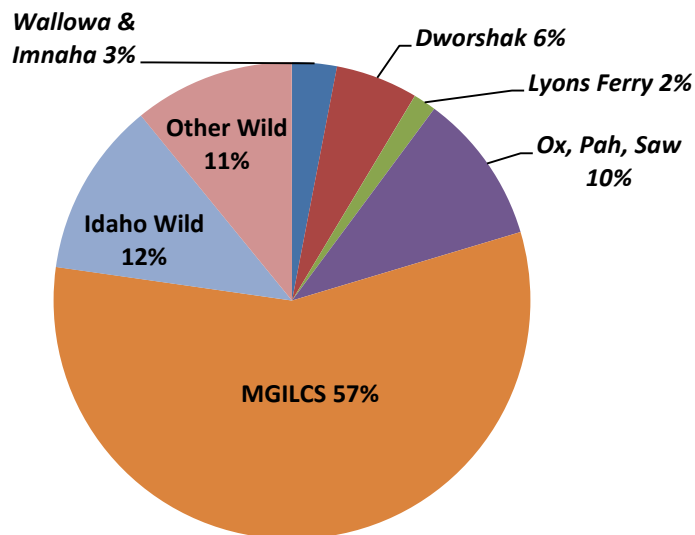


Figure 17. Contribution to tribal Zone 6 unclipped steelhead harvest by hatchery stock from August 1 to August 20, 2012. Hatchery release groups are shown with an italic font. Ox, Pah, Saw = all Oxbow, Pahsimeroi, and Sawtooth hatchery release groups combined. Idaho Wild include fish assigned to the MF Salmon, SF Salmon, SF Clearwater, Upper Clearwater, and Upper Salmon reporting groups.

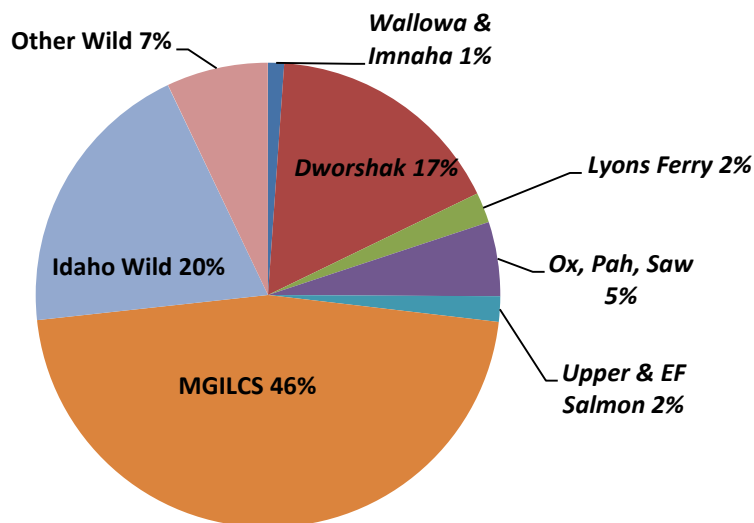


Figure 18. Contribution to tribal Zone 6 unclipped steelhead harvest by hatchery stock from August 21 to November 10, 2012. Hatchery release groups are shown with an italic font. Ox, Pah, Saw = all Oxbow, Pahsimeroi, and Sawtooth hatchery release groups combined. Idaho Wild include fish assigned to the MF Salmon, SF Salmon, SF Clearwater, Upper Clearwater, and Upper Salmon reporting groups.

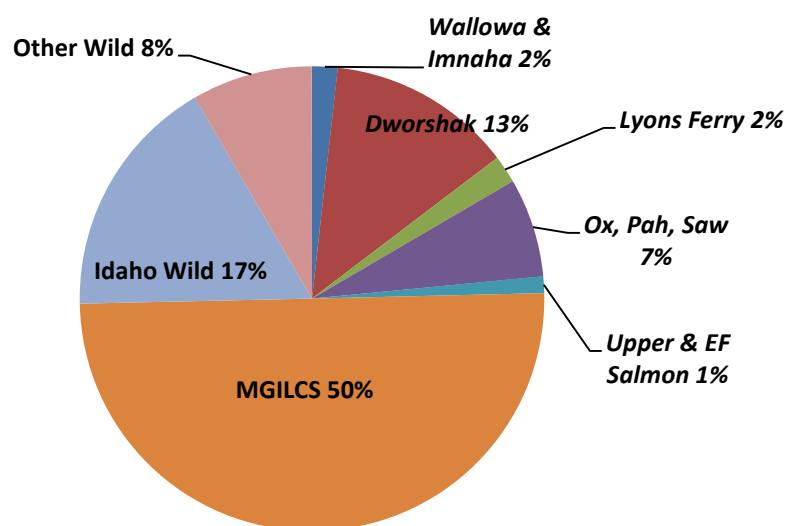


Figure 19. Contribution to tribal Zone 6 unclipped steelhead harvest by hatchery stock from August 1 to November 10, 2012. Hatchery release groups are shown with an italic font. Ox, Pah, Saw = all Oxbow, Pahsimeroi, and Sawtooth hatchery release groups combined. Idaho Wild include fish assigned to the MF Salmon, SF Salmon, SF Clearwater, Upper Clearwater, and Upper Salmon reporting groups.

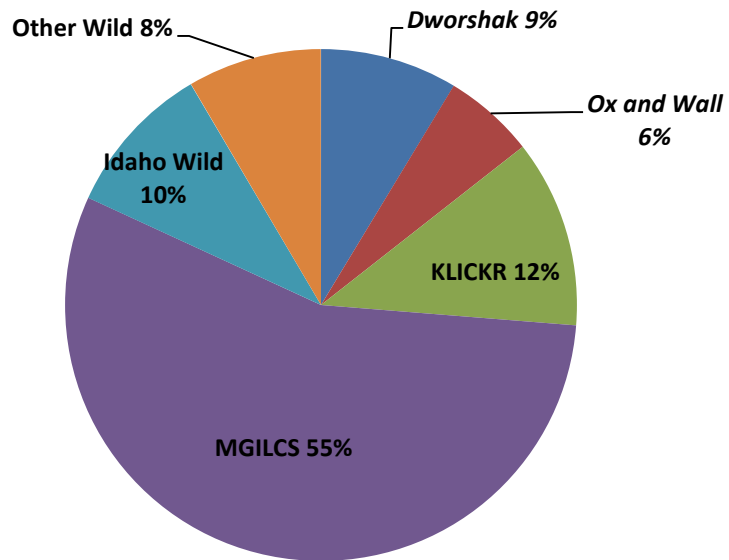


Figure 20. The estimated stock percentages in the unclipped tribal Drano Lake harvest in 2012. Unclipped hatchery stocks are shown in italic font.

APPENDIX A

Appendix A. The estimated harvest by hatchery stock (all release groups and brood years combined) in the lower Columbia River sport fishery from July 1 to October 31 in 2011 and 2012.

Hatchery stock	Estimated Harvest		Percent of Harvest	
	2011	2012	2011	2012
Dworshak	1,289	600	6%	4%
Lyons Ferry	1,858	1,473	9%	9%
Oxbow	3,129	2,720	15%	17%
Pahsimeroi	5,454	2,581	26%	16%
Sawtooth	2,953	2,200	14%	14%
Wallowa	883	1,175	4%	7%
Imnaha	448	197	2%	1%
Upper and EF Salmon	19	19	0.1%	0.1%
Total Snake River stocks	16,033	10,965	78%	69%
Other (non-Snake stocks)	4,569	4,958	22%	31%
Total Harvest	20,602	15,923		

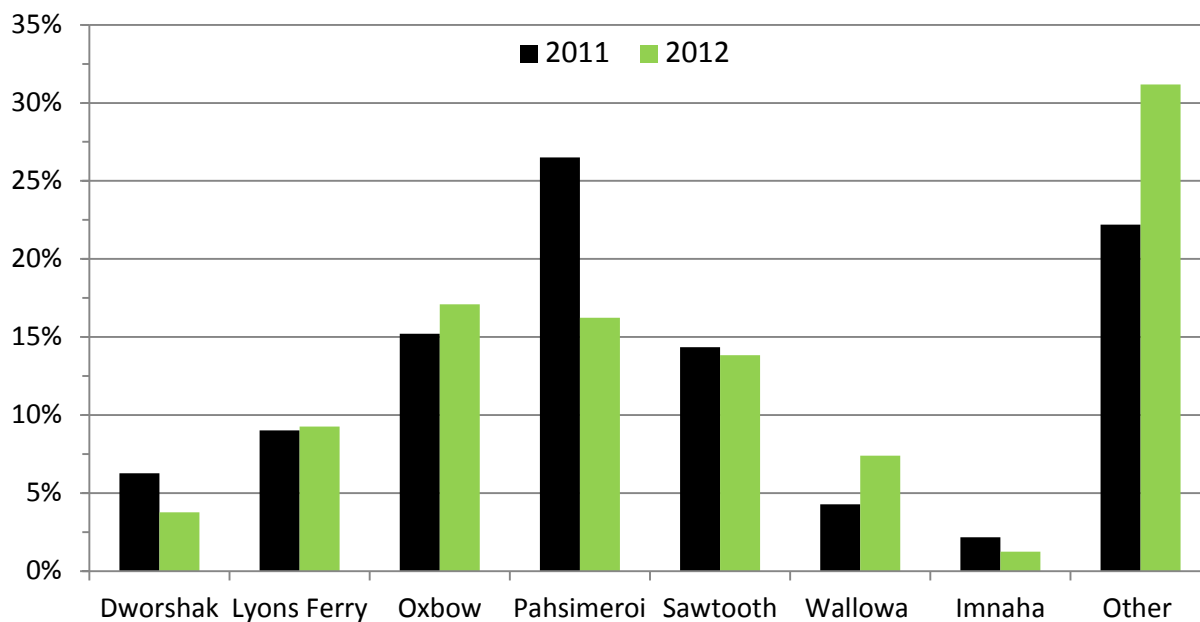


Figure A.1 The percent of total harvest by hatchery stock in the lower Columbia River sport fishery from July 1 to October 31 in 2011 and 2012.

APPENDIX B

Appendix B. The estimated harvest by hatchery stocks (all release groups and brood years combined) and GSI reporting groups in the tribal Zone 6 fishery in 2011 and 2012. Up = Upper.

Group	2011 Harvest			2012 Harvest			Percent of harvest	
	Clip	Unclip	Total	Clip	Unclip	Total	2011	2012
<u>Hatchery stocks</u>								
Dworshak	8,875	2,081	10,956	2,322	708	3,030	39.8%	19.9%
Lyons Ferry	939	0	939	784	18	802	3.4%	5.3%
Oxbow	1,703	49	1,752	1,415	90	1,505	6.4%	9.9%
Pahsimeroi	2,753	167	2,920	1,340	137	1,477	10.6%	9.7%
Sawtooth	1,814	361	2,175	1,273	151	1,424	7.9%	9.4%
Tucannon	0	49	49	0	88	88	0.2%	0.6%
Wallowa	772	0	772	1,061	58	1,119	2.8%	7.4%
Imnaha	183	0	183	86	39	125	0.7%	0.8%
Upper & EF Salmon	156	201	357	12	64	76	1.3%	0.5%
Other Hatchery	1,009	--	1,009	1,425	--	1,425	3.7%	9.4%
<u>GSI reporting group (Region)</u>								
BWSALM (Mid-Columbia)			14			35	0.1%	0.2%
KLICKR (Mid-Columbia)			215			62	0.8%	0.4%
LOWCOL (Lower Columbia)			43			0	0.2%	0.0%
MFSALM (Idaho)			287			167	1.0%	1.1%
MGILCS (Mid-Columbia and Snake)			3,417			2,747	12.4%	18.1%
SFCLWR (Idaho)			616			141	2.2%	0.9%
SFSALM (Idaho)			416			108	1.5%	0.7%
SKAMAN (Mid and Lower Columbia)			72			70	0.3%	0.5%
UPCLWR (Idaho)			504			249	1.8%	1.6%
UPPCOL (Upper Columbia)			327			232	1.2%	1.5%
UPSALM (Idaho)			433			267	1.6%	1.8%
YAKIMA (Mid-Columbia)			43			62	0.2%	0.4%
Total Hatchery	18,204	2,908	21,112	9,718	1,353	11,071	76.8%	72.8%
GSI total:	0	0	6,387	0	0	4,140	23.2%	27.2%
Grand total:	18,204	2,908	27,499	9,718	1,353	15,211		

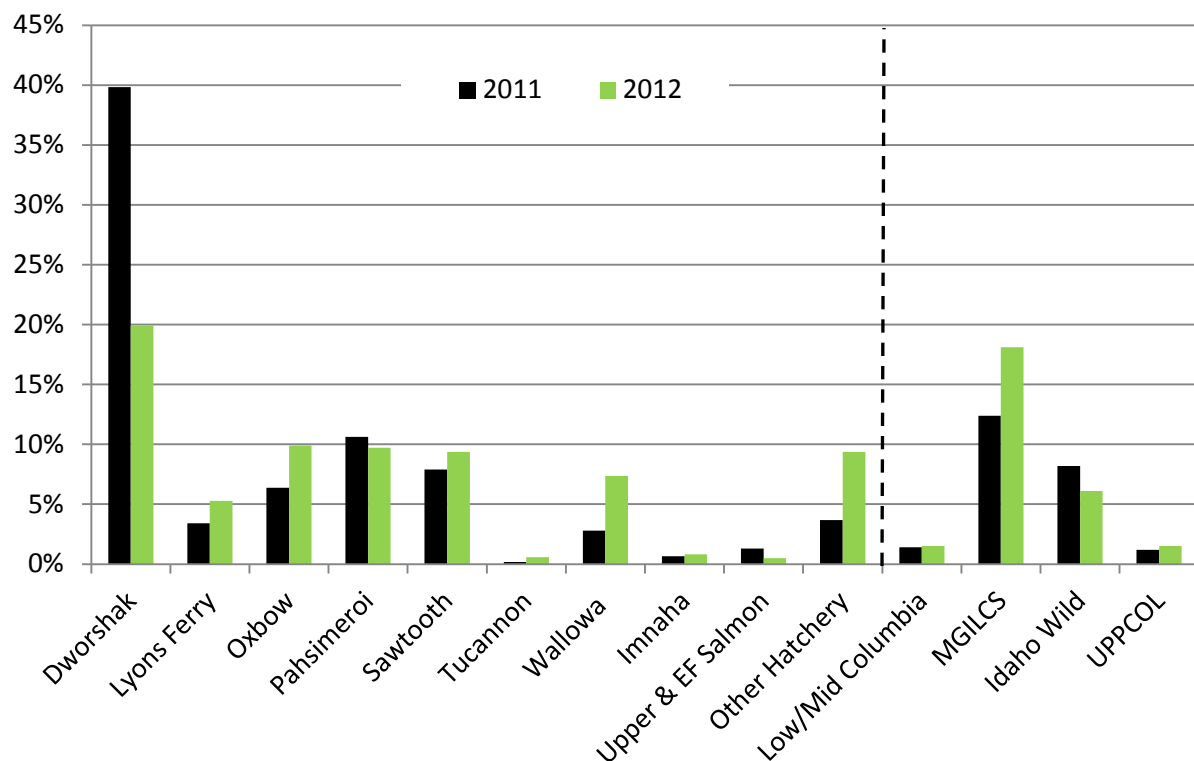


Figure B.1 The estimated stock percentages by hatchery stock (left of dashed line) and GSI reporting group (right of dashed line) in the total tribal (clipped plus unclipped) steelhead harvest in Zone 6 in 2011 and 2012. Low/Mid Columbia includes GSI groups: BWSALM, KCLICKR, LOWCOL, SKAMAN, and YAKIMA. Idaho Wild includes GSI groups: MFSALM, SFCLWR, SFSALM, UPCLWR, and UPSALM.

APPENDIX C

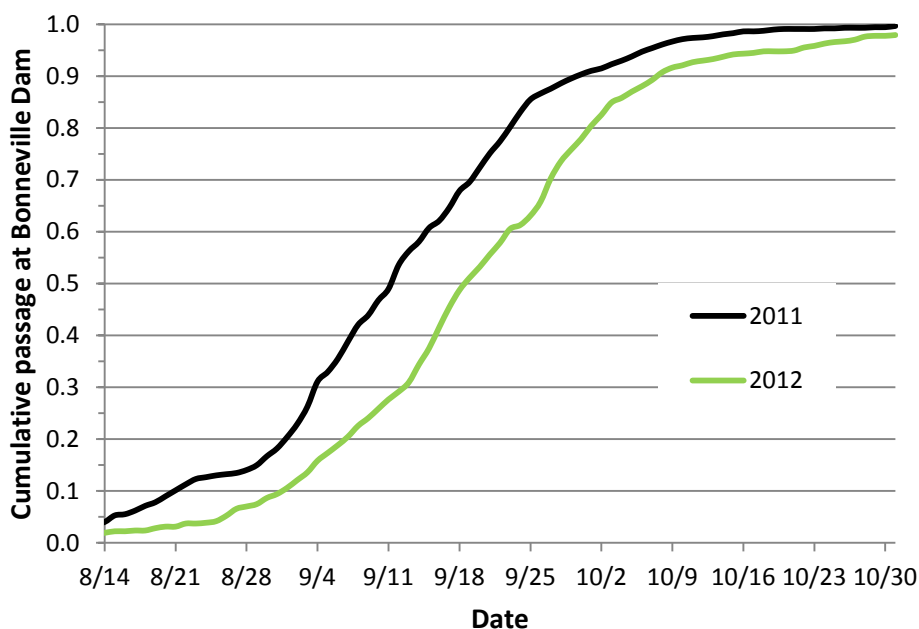


Figure C.1 Run-timing of the Dworshak steelhead stock at Bonneville Dam in 2011 and 2012.

Table C.1 Harvest of fall Chinook and steelhead in the tribal Zone 6 fishery by statistical week in 2011 and 2012. The dates in statistical week 35 – 41 are the opening and closing date of the commercial net fishery. Platform fisheries were open daily from August 1 onward.

2011 Zone 6 Tribal Harvest					2012 Zone 6 Tribal Harvest				
Stat Week	Start Date	End Date	Total Chinook	Total Steelhead	Stat Week	Start Date	End Date	Total Chinook	Total Steelhead
31 - 34	8/1	8/20	239	2,240	32 - 34	8/1	8/20	378	4,490
35	8/22	8/25	5,880	2,679	35	8/21	8/23	3,351	1,132
36	8/29	9/2	12,216	2,873	36	8/27	8/30	9,002	924
37	9/6	9/10	39,907	2,885	37	9/4	9/8	29,102	2,249
38	9/12	9/16	33,342	3,657	38	9/11	9/14	27,798	1,834
39	9/19	9/23	26,669	7,538	39	9/18	9/21	16,065	2,230
40	9/26	9/29	11,426	2,884	40	9/26	9/28	4,184	1,016
41	10/3	10/6	5,932	2,217	41	10/2	10/4	2,716	935
42 +	10/7	11/26	321	526	42 +	10/5	11/10	275	400
Total:			135,932	27,499				92,871	15,211

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