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2015 CALENDAR YEAR HATCHERY STEELHEAD REPORT:

IPC and LSRCP Monitoring and Evaluation Programs for the State of Idaho

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INTRODUCTION

This report summarizes hatchery steelhead monitoring and evaluation (M&E) activities associated with the Lower Snake River Compensation Plan (LSRCP) and Idaho Power (IPC) mitigation programs, which occurred in Idaho during the 2015 calendar year. Information is provided for steelhead from six broodstock collection sources and four rearing hatcheries operated by the IDFG and the USFWS.

The LSRCP steelhead hatchery mitigation program was established to provide in-kind and in-place mitigation for lost harvest opportunity resulting from the construction and operation of the four lower Snake River hydroelectric dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams). The Idaho component of the mitigation program calls for the operation of broodstock collection and rearing facilities operated by the Idaho Department of Fish and Game (IDFG) and the U.S. Fish and Wildlife Service (USFWS) under the auspices of the LSRCP. It is anticipated that the summer steelhead hatchery smolt release programs operated in Idaho will return 117,780 (71% of the total) adult steelhead towards the total LSRCP mitigation goal of 165,300 adult steelhead (US Army Corps of Engineers 1975 [COE]). The remaining 29% of the adult return are from Oregon and Washington releases.

The IPC maintains a hatchery steelhead mitigation program as part of the Hells Canyon Settlement Agreement (HCSA) of 1980 resulting from the construction and operation of the Hells Canyon Complex (Brownlee, Oxbow, and Hells Canyon dams). Mitigation goals established through the HCSA specifies an annual smolt production target of 400,000 pounds to be reared at the Niagara Springs Fish Hatchery, which equates to approximately 1,800,000 yearling smolts at 4.5 fish per pound.

As this report summarizes information for a calendar year, data from multiple brood years are included. Brood year specific reports are produced annually by monitoring and evaluation staff and are available as IDFG reports at: https://researchidfg.idaho.gov/Fisheries%20Research%20Reports/Forms/Show%20All%20Reports.aspx. Because of the five-year life cycle of steelhead and to allow for downriver harvest to be reported, the most recent brood year report available is current year minus seven.

Steelhead Broodstock Collection Facilities

Steelhead eggs are collected from females trapped at four hatchery weirs and one satellite facility (Table 1, Figures 1 and 2). The South Fork Clearwater River (SFCR) stock is collected by volunteer anglers who donate their catch from the South Fork Clearwater River to the SFCR program. With the exception of Clearwater Fish Hatchery, which initiated an angler broodstock collection program in 2010, none of the other steelhead rearing hatcheries discussed in this report collect broodstock. Eggs are transferred to rearing facilities that do not collect their own broodstock (Table 1). In most cases, broodstock are 100% hatchery origin (known as a "segregated program") except for the integrated supplementation program in the East Fork Salmon River (EFNAT) which has a goal of X% natural origin broodstock.

Hatchery steelhead broodstocks used in Idaho hatcheries include both A-index and B-index run types. The run designations are based on fish length and migration timing and were originally established by fisheries managers in the Columbia River for in-season fisheries management. The Stocks classified as A-run types predominately spend one year in the ocean while stocks classified as B-run types spend predominantly two years in the ocean before returning as adults.

Table 1. Broodstock collection facilities that provide steelhead eggs to the LSRCP and IPC mitigation hatcheries in Idaho.

Broodstock Collection Facility	Hatchery Abbreviation	Stock Abbreviation (Run Type)	Mitigation Program
Dworshak National Fish Hatchery[1]	DNFH	DWOR (B-run)	COE
South Fork Clearwater River[2]	CLFH	SFCR (B-run)	LSRCP
Oxbow Fish Hatchery	OXFH	OX (A-run)	IPC
Pahsimeroi Fish Hatchery	PFH	PAH (A-run)	IPC
		USAL (B-run)	LSRCP
Sawtooth Fish Hatchery	SFH	SAW (A-run)	LSRCP
East Fork Salmon River Satellite Facility[3]	EFSF	EFNAT (A-run)	LSRCP

1. Dworshak National Fish Hatchery operates a steelhead mitigation program funded by the U.S. Army Corps of Engineers (COE) that is not included in this report.
2. Broodstock is currently collected in the South Fork Clearwater River by angling.
3. Operated by Sawtooth Fish Hatchery.

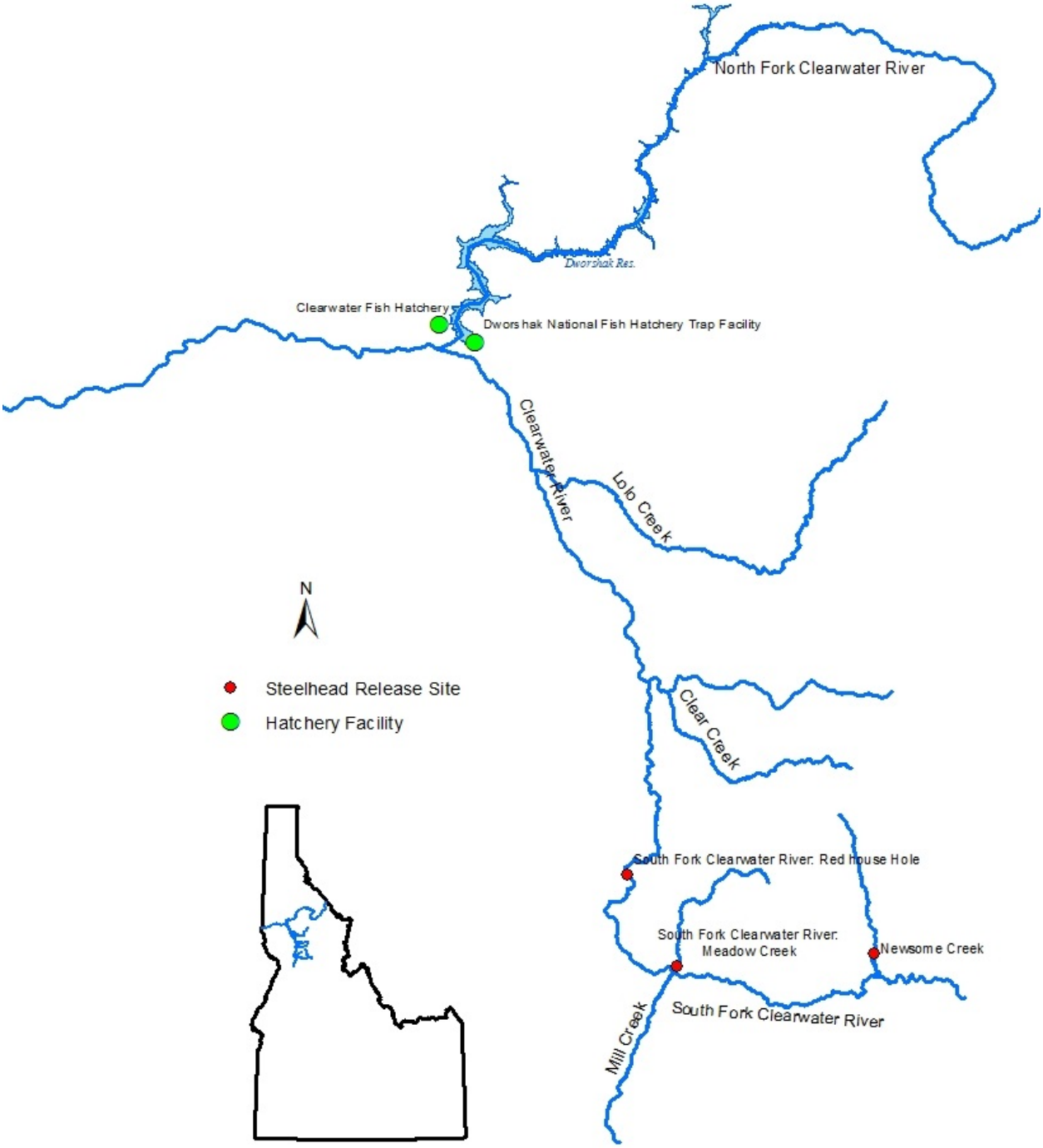

Figure 1. Location of steelhead release sites and hatchery facilities in the Clearwater River basin associated with the LSRCP mitigation program.

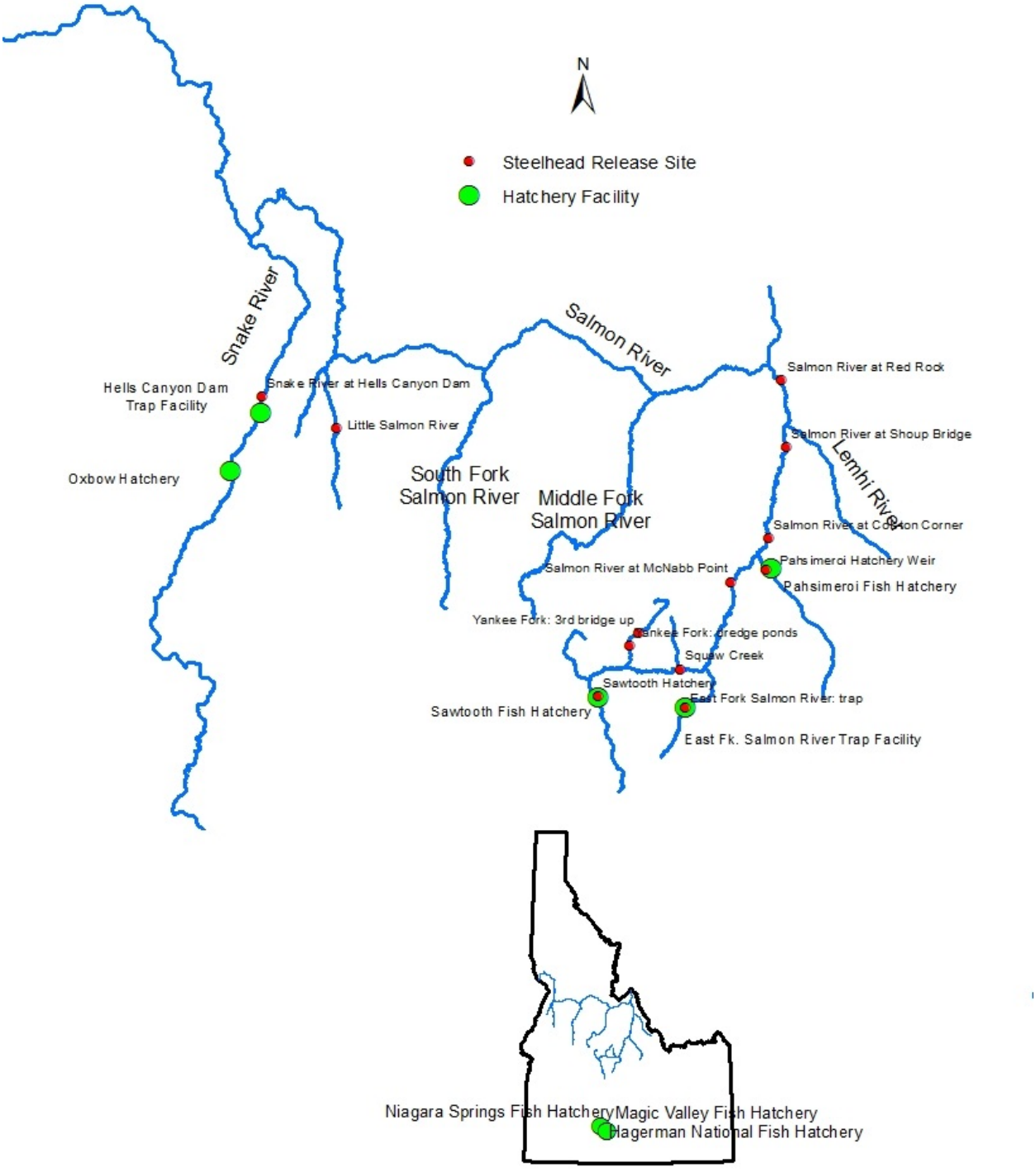

Figure 2. Location of steelhead release sites and hatchery facilities in the Salmon and Snake River basins associated with the LSRCP and IPC mitigation programs.

IPC Rearing Facility and Release Goals

Niagara Springs Fish Hatchery (Niagara Springs) is located on the Snake River near Wendell, Idaho. Niagara Springs receives eyed eggs from Pahsimeroi Fish Hatchery (PAH stock) and from Oxbow (OX stock) Fish Hatchery. The smolt production goal for Niagara Springs is 400,000 pounds of smolts annually, which equates to approximately 1,800,000 yearling smolts at 4.5 fish per pound (Figure 2, Table 2).

LSRCP Rearing Facility and Release Goals

Clearwater Fish Hatchery (Clearwater) is located at the confluence of the North Fork Clearwater River near Ahsahka, Idaho and is the only LSRCP steelhead rearing facility located in current-day anadromous waters within Idaho (Figure 1). The annual mitigation goal for this facility is to produce 42,000 adult steelhead. Clearwater annually releases 843,000 smolts to achieve this goal (Table 2). Clearwater's annual production target was originally 1,750,000 smolts; however, production was reduced to 843,000 smolts due to limited water availability and to provide more rearing space for the Chinook Salmon program at that facility. Despite these changes, the adult return goal remains the same. Clearwater historically received DWOR stock green eggs from Dworshak National Fish Hatchery (Dworshak) and reared them to yearling smolts for release into the South Fork Clearwater River. However, in 2010, a program was initiated to develop a hatchery stock (SFCR) that is locally adapted to the South Fork Clearwater River by utilizing broodstock collected by anglers as a temporary measure until an adult collection facility can be constructed in the South Fork Clearwater River (see the Localized Broodstock Development section of this report). Although the primary goal is to utilize only SFCR broodstock for all smolt releases into the South Fork Clearwater River, DWOR stock progeny will continue to be used if there is a deficit of SFCR broodstock. In addition to its primary mitigation function, Clearwater also receives green DWOR eggs that are incubated to the eyed egg stage before being transferred to Magic Valley Fish Hatchery (Magic Valley) for final rearing and release into the Salmon River as part of the Upper Salmon River (USAL) B program (a B-run stock locally adapted to the upper Salmon River). The USAL program is the continuation of efforts that were initiated with the transfer of DWOR broodstock in 1974 to establish a B-run stock in the upper Salmon River basin. Transferring DWOR eggs to Magic Valley will be phased out in the future as USAL production increases.

Hagerman National Fish Hatchery (Hagerman) is located along the Snake River in southern Idaho near the town of Hagerman, Idaho (Figure 2). The annual mitigation goal for this facility is to return 40,800 adult steelhead. Hagerman's annual production target was originally 1,700,000 smolts; however, production was incrementally reduced to 1,470,000 smolts as a result of continued reductions in flow from the springs that provide water for the hatchery (Table 2). In an effort to mitigate for these losses to production, Hagerman implemented a pilot study to evaluate the effectiveness of installing and operating a partial reuse aquaculture system (PRAS) to rear an additional 90,000 fish in three circular tanks that partially reuses water that is filtered then recirculated back through the tanks. This system was put into operation in 2015 increasing production at the facility to 1,560,000 smolts. A more detailed description of the PRAS and the study design to evaluate the effectiveness of the system and the performance of fish reared in it is presented in the "Hagerman PRAS Description and Evaluation" section below. Hagerman receives eyed eggs from two stocks (SAW and EFNAT), which are reared to yearling smolts and released in the upper Salmon River (Table 2). The rearing of EFNAT smolts at Hagerman began in brood year 2009. Prior to this, EFNAT smolts were reared at Magic Valley.

Magic Valley is located along the Snake River near Filer, Idaho. The annual mitigation goal for this facility is to return 34,980 adult steelhead (Table 2). Magic Valley's annual production target was originally 1,749,000 smolts; however, production has been incrementally reduced to 1,540,000 smolts as a result of continued reductions in flow from the springs that provide water for the hatchery. Magic Valley receives eyed eggs from three stocks (DWOR, PAH, and USAL), which are reared to yearling smolts. Magic Valley is responsible for rearing all LSRCP-funded DWOR, USAL, and PAH production released into the Salmon River.

Table 2. Migration year 2015 steelhead smolt release goals for IPC and LSRCP facilities and adult return mitigation goals for LSRCP facilities.

Rearing Facility	Mitigation Program	Stock	Smolt Release Goal	Adult Return Mitigation Goal
Clearwater	LSRCP	SFCR	843,000	42,000
Clearwater Production Total			**843,000**	
Hagerman	LSRCP	SAW	1,500,000	40,800
		EFNAT	60,000	
Hagerman Production Total			**1,560,000**	
Magic Valley	LSRCP	PAH	465,000	34,980
		DWOR/USAL	1,085,000	
Magic Valley Production Total			**1,550,000**	
Niagara Springs	IPC[1]	OX	800,000	
		PAH	1,000,000	
Niagara Springs Production Total			**1,800,000**	

[1] Idaho Power Company's (IPC) mitigation agreement is to release 400,000 lbs. of smolts at about 4.5 fish/lb., which equates to 1,800,000 smolts. There is no adult return mitigation agreement for IPC.

JUVENILE PRODUCTION AND RELEASES

Marking

The IDFG contracts with Pacific States Marine Fisheries Commission (PSMFC) for marking and tagging of juvenile steelhead marking crew (Friedrich and Roby 2015). A complete overview of the anadromous fish marking and tagging program is annually reported and available through the IDFG website: https://collaboration.idfg.idaho.gov/Fisheries TechnicalReports/Forms/AllItems.aspx.

For 2015, M&E staff collaboratively developed mark and loading plans with hatchery and marking personnel. In June, a loading plan was developed that outlined preliminary mark and coded wire tag (CWT) numbers for Brood Year 2015 steelhead. In November and December, both a Passive Integrated Transponder (PIT) Tag loading plan for Brood Year 2015 and a mark/CWT plan for Brood Year 2016 were developed. Loading plans are designed to indicate where specific groups of marks and tags should be applied at each individual hatchery, taking into account family units, rearing containers, and any specific treatments of fish. Plans are developed in an effort to maximize tag representation while at the same time maintaining a manageable tagging and rearing scheme.

Under current operations, steelhead typically can receive an adipose fin clip (hereafter referred to as ad-clipped) mark and two types of tags (CWT and/or PIT). In addition, all hatchery-origin steelhead are parentage-based tagged (PBT) through genetic analysis of tissue samples collected from every fish used as broodstock. The purpose and uses of those marks and tags are outlined below.

Adipose Fin Clips

The presence or absence of an adipose fin is used as the sole designator of a harvestable hatchery-origin fish in mark selective fisheries and is also one of the primary indicators of origin at hatchery traps. Some adipose fin-intact (hereafter referred to as ad-intact) hatchery smolts are released to meet other management objectives but can generally be identified as hatchery origin by secondary characteristics (fin erosion or CWT).

Coded Wire Tags

Coded wire tags have been an important tool for monitoring and evaluating steelhead release group-specific harvest and stray estimates. These tags also provide a known age component at hatchery traps to use in assigning an age composition to the entire hatchery return at each trap. Lastly, CWTs are used as a differential mark for broodstock and weir management purposes. The use of CWTs for monitoring and evaluating steelhead harvest and stray estimates is being replaced with PBT beginning with brood year 2008, when 100% of the adult steelhead spawned within Snake River basin hatcheries had fin tissue samples taken to create a parentage-based genetics database (Steele et al. 2013). Smolts released in 2013 from brood year 2012 are the last group that were tagged and released with CWTs for the purpose of harvest estimation.

Parentage-Based Tags

All broodstock spawned at Idaho hatcheries since 2008 had a fin clip taken for a genetic sample (Steele et al. 2013). These genetic samples are used to identify juvenile fish produced from each parental cross that is recorded within the genetics baseline database. At any point in the offspring's life cycle, a tissue sample can be collected, and through the genetic baseline can be assigned back to its hatchery, stock, cohort, and release site. PBT is beneficial because fish are 100% marked and sampling to detect the mark is non-lethal. PBT can be used to generate stock and age compositions of fisheries, on spawning grounds, and at hatchery traps. Tissue samples are also collected at the adult trap at Lower Granite Dam (LGD), which allows stock-, age-, and release-site-specific adult return estimates to be generated for the entire hatchery-origin return to LGD using PBT.

Passive Integrated Transponder Tags

Passive integrated transponder (PIT) tags serve multiple purposes and like CWTs and PBT are an important tool for monitoring and evaluating hatchery steelhead programs. PIT tags are used to generate estimates of juvenile survival to LGD and juvenile run timing through the Snake and Columbia river hydropower system. As fish return as adults, PIT tags provide in-season stock- and age-specific return estimates and arrival timing, as well as conversion rates between dams. All of these parameters are outlined in this report.

All PIT tags implanted in hatchery steelhead go through the sort-by-code process prior to juvenile outmigration. The sort-by-code process enables managers to predetermine how a PIT-tagged fish will be treated if detected in one of the juvenile bypass systems at a Snake River or

Columbia River dam. As part of ongoing research for the Comparative Survival Study (CSS), sort-by-code is used to determine if a PIT-tagged fish should be treated as the run-at-large or by default, returned to the river (http://www.fpc.org/). The majority of PIT tags (about 70%) are assigned to the run-at-large group, which means if detected, they will either be transported downriver on a barge or truck, or returned back to the river based on what the current protocol is at that particular dam for the untagged population. The remaining 30% are assigned to the return-to-river group and are treated independently of the untagged population and automatically returned to the river, if detected. Because the run-at-large component represents the untagged population, they are the only tags that are expanded to generate the adult return estimates outlined above.

Juvenile Release Information

From March through May 2015, 5,907,083 (1,865,488 IPC; 3,837,770 LSRCP) brood year 2014 yearling steelhead smolts were released at locations in the Clearwater, Salmon, and Snake rivers (Figures 1 and 2; Table 3). All facilities met or slightly exceeded their smolt release targets.

Table 3. Summary of brood year 2014 hatchery steelhead released in 2015 from IPC and LSRCP facilities.

Hatchery	Release Site	Stock	Total Release	Ad-Clipped Only	AD/CWT	CWT	No Mark	PIT Tags[1]	PBT Tag Rate[2]
Clearwater	Newsome Cr.	DWOR	155,081	-	-	-	155,081	1,501	0.98
	Meadow Cr.	DWOR	113,896	113,896	-	-	-	1,292	0.98
	Meadow Cr.	DWOR	77,909		-	-	77,909	1,298	1.00
	Red House Hole	DWOR	224,554	224,554	-	-	-	2,594	1.00
	Meadow Cr.	SFCR	203,005	203,005	-	-	-	6,793	1.00
	Meadow Cr.	SFCR	153,178	-	-	150,625	2,553	4,600	1.00
	Clearwater Totals		**927,623**	**541,455**	**-**	**150,625**	**235,543**	**18,078**	
Hagerman	E. Fk. Salmon R.	EFNAT	61,357	-	-	60,098	1,259	8,534	1.00
	McNabb Point	SAW	128,381	128,381	-	-	-	-	0.96
	Sawtooth Weir	SAW	1,342,274	1,161,256	181,018	-	-	25,977	0.99
	Hagerman Totals		**1,532,012**	**1,289,637**	**181,018**	**60,098**	**1,259**	**34,511**	
Magic Valley	Pahsimeroi R.	DWOR	94,647	-	-	93,700	947	5,690	0.98
	Yankee Fk. at 3rd bridge	DWOR	123,799	123,799	-	-	-	3,396	1.00
	Yankee Fk. Ponds	DWOR	65,624	-	-	-	65,624	1,794	1.00
	Little Salmon R. at Hazard Cr.	PAH	376,531	376,531	-	-	-	2,196	0.99
	Colston Corner	PAH	189,362	189,362	-	-	-	1,893	1.00
	Red Rock	PAH	157,608	157,608	-	-	-	1,898	1.00
	Shoup Bridge	PAH	157,809	157,809	-	-	-	1,897	1.00
	Little Salmon R. at Hazard Cr.	USAL	33,698	33,698	-	-	-	2,192	1.00
	Pahsimeroi R.	USAL	94,313	-	-	92,743	1,570	5,677	1.00
	Yankee Fk. at 3rd bridge	USAL	174,023	127,641	-	-	46,382	3,581	1.00
	Yankee Fk. Ponds	USAL	114,546	-	-	-	114,546	4,489	1.00
	Magic Valley Totals		**1,581,960**	**1,166,448**	**-**	**186,443**	**229,069**	**34,703**	
Niagara Springs	Little Salmon R. at Stinky Spgs.	OX	210,127	210,127	-	-	-	2,493	0.92
	Hells Canyon Dam	OX	572,077	572,077	-	-	-	8,553	0.98
	Little Salmon R. at Stinky Spgs.	PAH	258,507	258,507	-	-	-	2,581	1.00
	Pahsimeroi R.	PAH	824,777	824,777	-	-	-	8,959	0.99
	Niagara Springs Totals		**1,865,488**	**1,865,488**	**-**	**-**	**-**	**22,586**	
	Grand Totals		**5,907,083**	**4,863,028**	**181,018**	**397,166**	**465,871**	**109,878**	

[1] PIT tag release numbers are not in addition to other mark tag combinations but are included in those groups.
[2] PBT tag rate is the proportion of released smolts whose parental genotypes are in the broodstock database and can be tracked to the juvenile release site.

Out-migration Survival and Environmental Conditions

Juvenile survival rates of PIT-tagged steelhead to LGD are estimated using the PITPro software program (Westhagen and Skalski 2009) developed in the School of Aquatic and Fishery Sciences at the University of Washington. PitPro is designed to translate PIT tagging and interrogation data into usable capture histories for SURPH (SURvival under Proportional Hazards), which is a program developed to analyze data from release-recapture studies of animal populations (Lady et al. 2013). Output files generated by PitPro produce a point estimate of survival and a standard error that is used to generate 95% confidence intervals for a SURPH2 data program output. The program uses the Cormack-Jolly-Seber model (Cormack 1964; Jolly 1965; Seber 1965) for single release and multiple recapture events, which is adjusted for differences in collection efficiency at the mainstem Snake River dams. An intuitive derivation of the release-recapture parameters used in the survival estimate adjusted for detection probability is provided by Lady et al. (2013):

$$\widehat{S_1} = \left(\frac{m_1}{R}\right)\left(\frac{1}{\hat{P}_1}\right)$$

where $\hat{S}$ is the estimate of survival to LGD, $m_1$is the number of detections at event 1 (LGD), R is the number of PIT tags initially released, and $\hat{P}_1$ represents the probability of detection. The probability of detection is the ratio of tags detected at LGD which are also detected at any of the five mainstem downriver detection sites to those detected only at any of the downriver detection sites, which include Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, and Bonneville dams. In the event that the probability of detection is lower than the unadjusted estimate of survival, the adjusted estimate of survival will exceed 100%.

Adjusted juvenile survival estimates of all release groups to LGD in 2015 ranged from 41.1-116.7% (Table 4). Three release groups in which adjusted estimates of survival exceeded 100% are an example of where the probability of detection was lower than the unadjusted estimate of survival. Survival rates of fish reared at Hagerman were broken down into three release groups that represent specific rearing conditions within the raceways for the purpose of comparing performance between fish reared in the circular PRAS with those reared in conventional raceways (see “Hagerman PRAS Description and Evaluation” section below for more details). The lowest survival rate from Hagerman was 41.1%, which was the ad-clipped SAW stock group reared in the circular PRAS tanks at Hagerman. The release group reared in the conventional raceways being used as the study control had the highest survival rate, which was 94.1%. Survival rates from Clearwater release groups ranged from 69.1% up to 93.0%. Magic Valley has the largest number of release groups, with survival rates ranging from 53.1% for the USAL stock at the Yankee Fk. ponds release site up to 100% (105.9% calculated with the PITPro program) for the USAL stock released in the Yankee Fk at the 3rd bridge. Releases of PAH stock and OX stock smolts from Niagara Springs into the Little Salmon River were both up to 100%. The Hells Canyon Dam release of OX stock smolts was 71.3%.

Juvenile survival estimates of the various release groups to LGD were compared with previous years’ estimates (Table 5). The weighted average survival of all groups combined in 2015 was 80.3%, as compared to 79.6% for all groups combined from migration years 2008-2014.

Appendix A provides juvenile release timing information and environmental conditions in the upstream migration corridor. Appendix B summarizes arrival timing at LGD as well as spill and outflow that coincided with the migration period.

Table 4. Estimated adjusted survival from release to LGD of brood year 2014 steelhead released from IPC and LSRCP hatchery facilities in 2015. All release groups were ad-clipped unless otherwise noted.

Hatchery	Release Group	Stock	PIT Tags Released	Release Date	50% Passage Date	80% Arrival Window	Adjusted % Survival (95% CI)[1]
Clearwater	Newsome Cr.	DWOR	1,501	4/9/2015	4/24/2015	4/18 - 5/14	87.7 (55.9-119.5)
	Red House Hole	DWOR	2,594	4/6/2015	4/13/2015	4/11 - 5/4	69.1 (57.2-81)
	Meadow Cr.	DWOR	1,292	4/8/2015	4/19/2015	4/13 - 5/12	93.0 (59.7-126.3)
	Meadow Cr.	SFCR	6,793	4/8/2015	4/21/2015	4/14 - 5/13	75.8 (66.9-84.7)
	Meadow Cr. Ad-intact	DWOR	1,298	4/8/2015	4/20/2015	4/13 - 5/11	80.7 (55.5-105.9)
	Meadow Cr. Ad-intact	SFCR	4,600	4/8/2015	4/20/2015	4/14 - 5/11	69.1 (57.7-80.5)
Hagerman	E. Fk. Salmon R. Ad-intact	EFNAT	8,534	4/30/2015	5/20/2015	5/8 - 6/6	61.6 (49.3-73.9)
	Sawtooth Weir	SAW	25,977	4/6/2015	5/3/2015	4/21 - 5/23	73.1 (66.2-80.0)
	Sawtooth Weir PRAS	SAW	8,670	4/6/2015	5/14/2015	4/22 - 6/10	41.1 (31.6-50.6)
	Sawtooth Weir Control	SAW	8,753	4/6/2015	4/28/2015	4/21 - 5/11	94.1 (81.0-107.2)
Magic Valley	Little Salmon R. @ Stinky Spgs.	PAH	2,196	4/14/2015	4/27/2015	4/23 - 5/17	93.1 (76.2-110.0)
	Little Salmon R. @ Stinky Spgs.	USAL	2,192	4/17/2015	4/28/2015	4/24 - 5/12	85.2 (73-97.4)
	Pahsimeroi R. Ad-intact	DWOR	5,690	4/20/2015	5/8/2015	5/2 - 5/21	62.7 (52.3-73.1)
	Pahsimeroi R. Ad-intact	USAL	5,677	4/21/2015	5/6/2015	5/1 - 5/14	67.6 (53.1-82.1)
	Salmon R. @ Colston	PAH	1,893	4/10/2015	4/28/2015	4/23 - 5/11	76 (60.1-91.9)
	Salmon R. @ Red Rock	PAH	1,898	4/6/2015	4/26/2015	4/21 - 5/11	88.7 (63.9-113.5)
	Salmon R. @ Shoup Bridge	PAH	1,897	4/8/2015	4/25/2015	4/20 - 5/9	86.1 (58.9-113.3)
	Yankee Fk. at 3rd Bridge	DWOR	3,396	4/27/2015	5/10/2015	5/5 - 5/27	66 (45.1-86.9)
	Yankee Fk. at 3rd Bridge	USAL	3,581	4/23/2015	5/7/2015	5/5 - 5/20	105.9 (55.5-156.3)
	Yankee Fk. Ponds Ad-intact	DWOR	1,794	4/27/2015	5/25/2015	5/11 - 6/9	62.5 (16.8-108.2)
	Yankee Fk. Ponds Ad-intact	USAL	4,489	4/23/2015	5/13/2015	5/7 - 5/30	53.1 (37.2-69.0)
Niagara Springs	Hells Canyon Dam	OX	8,553	3/23/2015	4/20/2015	4/1 - 6/6	71.3 (64.3-78.3)
	Little Salmon R. @ Stinky Spgs.	OX	2,493	4/24/2015	5/7/2015	5/4 - 5/23	116.7 (68.1-164.6)
	Little Salmon R. @ Stinky Spgs.	PAH	2,581	4/22/2015	5/7/2015	4/29 - 5/18	106.0 (76.3-135.7)
	Pahsimeroi R.	PAH	8,959	4/2/2015	4/27/2015	4/22 - 5/12	85.8 (76.3-95.3)

[1] Adjusted estimates of survival will exceed 100% when the probability of detection is less than the estimate of survival.

Table 5. Annual and seven-year adjusted estimated survival (percent) from release to LGD for steelhead smolts released from IPC and LSRCP hatcheries, by stock and migration year. Prior to migration year 2008, PIT tag sample sizes were small resulting in spurious survival estimates in some years.

		Migration Year								
Rearing Hatchery	**Stock**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2008-2014 Average**
Clearwater	DWOR	69.5	83.1	83.3	80.3	74.0	62.8	85.6	80.5	76.9
	SFCR				80.4	81.5	65.4	86.0	72.9	78.3
Clearwater Average		**69.5**	**83.1**	**83.3**	**80.3**	**76.7**	**63.6**	**85.7**	**77.6**	**77.5**
Hagerman	EFNAT[1]	78.2	71.8	70.9	79.9	81.2	62.6	66.8	61.6	73.0
	SAW	85.5	80.8	74.6	79.9	72.3	80.4	79.5	72.4	79.0
Hagerman Average		**85.5**	**80.8**	**74.3**	**79.9**	**73.5**	**78.3**	**78.9**	**72.0**	**78.7**
Magic Valley	DWOR	76.4	78.9	76.5	72.0	77.2	63.4	77.9	64.1	74.6
	PAH	79.6	81.7	86.6	78.4	85.5	91.7	89.8	87.4	84.8
	USAL[2]	78.7	73.5	84.3	89.3	76.4	80.1	78.6	81.0	80.1
Magic Valley Average		**81.6**	**79.7**	**81.2**	**76.4**	**80.1**	**73.7**	**82.0**	**81.5**	**79.2**
Niagara Springs	OX	87.9	88.9	91.8	72.8	71.8	53.9	75.0	83.5	77.4
	PAH	83.8	89.7	95.2	76.4	74.9	69.0	96.7	90.6	83.7
Niagara Springs Average		**85.7**	**89.3**	**93.6**	**75.3**	**73.5**	**66.9**	**89.9**	**87.6**	**82.0**
Weighted Average		**81.0**	**83.8**	**83.7**	**77.5**	**75.7**	**70.9**	**84.4**	**80.3**	**79.6**

[1] Prior to migration year 2010, EFNAT smolts were reared at Magic Valley.
[2] Prior to migration year 2010, the USAL smolts were released at Squaw Pond or Squaw Creek.

ADULT RETURNS

Adult hatchery steelhead from brood years 2012, 2011, and 2010 returned to Idaho during the 2014-15 run as one-, two-, and three-ocean adults, respectively. This section accounts for adult hatchery steelhead returning to Bonneville Dam (Bonneville), LGD, and back to hatchery traps in Idaho.

Returns to Bonneville Dam and Lower Granite Dam

Estimates of the stock and cohort (brood year) composition of returning adult steelhead in spawn year 2015 were made with PIT tag detections at Bonneville and LGD and with PBT analysis at LGD. For the purposes of this report, spawn year 2015 encompasses adult return data to Bonneville and LGD between July 1, 2014 and June 30, 2015. This is the third run year that both PIT tag detections and PBT analysis were used for compositional analysis, providing an opportunity to compare both methodologies.

Estimated Escapement of Hatchery Steelhead at Bonneville Dam and Lower Granite Dam Based on PIT Tag Detections

Detections of PIT tags from hatchery origin steelhead at Bonneville and LGD fish ladders were expanded by dividing each unique PIT detection by the juvenile tagging rate. Expanded detections were summed across the migration period to estimate the escapement by stock and cohort, of steelhead released from fish hatcheries in Idaho. Detections at Bonneville were also adjusted by dividing the expanded PIT detection by the detection efficiency of the PIT tag array located in the Bonneville fish ladder. Detection efficiency at Bonneville is defined as the percent of tagged upstream migrating adults detected upstream of Bonneville that were also detected at Bonneville. The detection efficiency at Bonneville for the 2014-15 adult migration year was 98.7%. The detection efficiency for LGD is defined as the percent of tagged fish detected upstream of LGD that were also detected at LGD. Detection efficiency at LGD was 100% since all adult steelhead PIT tags detected at instream arrays and at hatchery racks were also detected at LGD. Previously collected data shows that PIT tags generally underestimate the untagged population likely due to tag loss, and potentially differential survival of tagged and untagged fish (Stiefel et al. 2012; Stiefel et al. 2013; Warren et al. 2015). With the exception of steelhead released at the Sawtooth Fish Hatchery weir, data are not available to make adjustments for tag loss or differential survival of tagged fish. A PIT array operated in the Sawtooth Fish Hatchery fish ladder enables expansion adjustments to be made for this release group to account for tag loss and survival differences between tagged and untagged fish (see “Estimating a Correction Factor for PIT Tag Expansions in Steelhead Returning to Sawtooth Fish Hatchery Trap,” this report). Tables 6 and 7 summarize the estimated adult returns for each rearing hatchery by stock and cohort at Bonneville and LGD. During the 2014-15 steelhead run an estimated 107,703 adult steelhead from Clearwater, Dworshak, Hagerman, Magic Valley, and Niagara Springs fish hatcheries returned to Bonneville (Table 6). The majority of these fish (74,347) escaped fisheries in the middle Columbia and lower Snake rivers and crossed LGD (Table 7).

Table 6. Summary of expanded PIT tag estimates for one-, two-, and three-ocean (Brood Years 2012, 2011, and 2010) steelhead passing upstream of Bonneville Dam by hatchery and stock. Estimates are adjusted for 98.7% detection efficiency.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Clearwater	DWOR	211	5,110	64	5,385
	SFCR	272	2,008	9	2,289
	CLFH Total	**483**	**7,119**	**73**	**7,674**
Dworshak	DWOR	1,169	17,722	-	18,891
	DNFH Total	**1,169**	**17,722**	**-**	**18,891**
Hagerman	SAW[1]	15,410	8,564	79	24,053
	EFNAT	835	1,754	-	2,589
	HNFH Total	16,245	10,317	79	26,642
Magic Valley	DWOR	456	4,746	160	5,363
	PAH	7,016	3,159	-	10,175
	SAW	-	906	-	906
	USAL	23	873	-	896
	MVFH Total	**7,496**	**9,684**	**160**	**17,340**
Niagara Springs	OX	1,269	8,171	-	9,441
	PAH	21,041	6,674	-	27,715
	NSFH Total	**22,311**	**14,845**	**-**	**37,156**
	Idaho Total	**47,704**	**59,687**	**312**	**107,703**

[1] Estimates for returns from brood years 2011 and 2012 SAW stock releases from Hagerman are adjusted with the tag loss correction factor determined using the PIT tag array in the Sawtooth Fish Hatchery ladder.

Table 7. Summary of expanded PIT tag estimates for one-, two-, and three-ocean (Brood Years 2012, 2011, and 2010) hatchery steelhead passing upstream of Lower Granite Dam by hatchery and stock.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Clearwater	DWOR	208	3,568	63	3,839
	SFCLW	215	1,549	9	1,773
	CLFH Total	**423**	**5,117**	**72**	**5,612**
Dworshak	DWOR	1,055	13,132	-	14,187
	DNFH Total	**1,055**	**13,132**	**-**	**14,187**
Hagerman	SAW[1]	11,128	5,480	78	16,686
	EF NAT.	506	1,299	-	1,805
	HNFH Total	**11,635**	**6,778**	**78**	**18,491**
Magic Valley	DWOR	311	2,710	79	3,100
	PAH	4,562	1,877	-	6,438
	SAW	-	650	-	650
	USAL	23	665	-	688
	MVFH Total	**4,895**	**5,902**	**79**	**10,876**
Niagara Springs	OX	1,075	5,265	-	6,339
	PAH	15,239	3,603	-	18,842
	NISP Total	**16,314**	**8,867**	**-**	**25,181**
	Idaho Total	**34,322**	**39,796**	**229**	**74,347**

[1] Estimates for returns from brood years 2011 and 2012 SAW stock releases from Hagerman are adjusted with the tag loss correction factor determined using the PIT tag array in the Sawtooth Fish Hatchery ladder.

Estimated Escapement of Hatchery Steelhead at Lower Granite Dam Based on Window Counts and PBT Analysis

Estimating Window Counts of Ad-clipped and Ad-intact Steelhead—The COE estimates daily steelhead passage at LGD by enumerating fish that pass a counting window located in the adult fish ladder. During the months of April through October observers count fish passing the window 50 minutes of each hour between 0400 and 2000 (COE 2015). Window counts are expanded by dividing the count by 0.833 (50 out of 60 minutes counted). During the months of November and December, fish are enumerated by reviewing videotape that was recorded continuously during the hours of 0400-2000 daily (COE 2014). The fish ladder was dewatered for annual maintenance during January and February 2015 then reopened with fish being enumerated by reviewing continuous videotape recordings made daily between the hours of 0600-1600 PST during the month of March then between the hours of 0400 and 2000 PST from April through June. Window counts are split into ad-clipped and ad-intact groups based on the presence or absence of an adipose fin when they are observed. The ad-clipped group consists of hatchery fish, and the ad-intact group is composed of natural origin and ad-intact hatchery fish. It is important to note that the COE window counts do not account for fish that pass the window outside of counting hours, those that pass through the navigation lock, or for those that fall back downstream over LGD with or without subsequent reascension. Estimated passage of adult steelhead for the period July 1, 2014 through June 30, 2015 included 110,408 ad-clipped and 55,183 ad-intact fish. The ad-intact estimate was made up of 9,394 ad-intact hatchery fish and 45,789 natural origin fish (Kristin Wright and Michael Ackerman, IDFG unpublished data). Similar to previous years, the majority (>90%) of steelhead crossed LGD between July and December.

Decomposing Window Counts into Natural and Hatchery Origin—Decomposing window counts of adult steelhead passing LGD into natural and hatchery origin groups is based on information obtained from fish sampled at the LGD adult trap. The adult trap is located in the fish ladder upstream from the fish counting window and is used to examine fish for marks and tags and to collect tissue samples for genetic analysis. Fish are collected by operating a trap gate that diverts fish migrating up the fish ladder into a collection chamber according to a predetermined sample rate. The sample rate determines how long the trap gate remains open during four intervals each hour, and the trap is operated 24 hours per day under normal operation. Data and biological samples are collected from steelhead that are captured in the trap according to established protocols. Data is collected at the LGD trap for numerous projects assessing returns of both natural origin and hatchery summer steelhead, spring/summer Chinook Salmon, and fall Chinook Salmon. Due to overlapping run timing distributions, a trapping rate is agreed upon to meet objectives for all projects and may change during the trapping season. The sample rate established for assessing returns of natural origin (ad-intact) steelhead exceeds that needed for assessing hatchery (ad-clipped) returns. Therefore, a subsample rate is established for ad-clipped hatchery steelhead. If the trapping rate changes during the season, the subsample rate for ad-clipped steelhead is adjusted to maintain a consistent sample rate across the run. The goal is to acquire approximately 1,000 tissue samples from ad-clipped steelhead from throughout the run for genetic analysis.

Trapping operations and sampling of spawn year 2015 adult steelhead began on July 1, 2014, with the protocol to sample fish five days per week. On July 7 the trap was shut down due to mechanical problems and elevated water temperatures. The trap was reopened on July 13, 2014 under an emergency order only for the purpose of capturing and transporting sockeye salmon *Oncorhynchus nerka*, which were undergoing high mortality rates due to abnormally high water temperature in the Columbia and lower Snake rivers. Sampling of adult steelhead resumed on August 7 when water temperatures dropped to below 70 degrees Fahrenheit. The time period

(7/7-8/6) when biological samples were not collected accounted for only 2% of the total ad-clipped adult steelhead window count from July 1, 2014 through June 30, 2015. The same time period accounted for 5% of the ad-intact (wild and hatchery origin combined) adult steelhead. Trapping and sampling of adult steelhead continued through November 11, 2014, at which time the trap was closed for winterization. The ladder remained open until Dec. 28, 2014 then shut down for winter maintenance until March 5, 2015 (Table 8).

The ladder was reopened in early March 2015 and counting resumed on March 5. Trapping resumed on March 10, 2015 with the first steelhead biological sample taken on March 12. Less than 5% of the run was observed to have passed LGD from March 2015 until the end of the run in June. A total of 1,563 tissue samples from ad-clipped steelhead were collected for the entire run year. A total of 4,882 samples were collected from ad-intact steelhead during this same time period.

Because ad-intact steelhead include both hatchery and naturally produced steelhead it is necessary to decompose the ad-intact steelhead into hatchery and natural groups. Protocols at the trap are to determine origin of ad-intact steelhead by checking for the presence of CWT and visually scanning the fish for dorsal or ventral fin erosion ("stubbies") (Schrader et al. 2014). Genetic samples are collected and processed from all ad-intact steelhead and compared to the hatchery genetic PBT baseline. The final analysis between the inspection of fish at the trap and the results of the PBT analysis indicate that 875 of the 4,882 samples collected from ad-intact steelhead were of hatchery origin. The final adjusted escapement of hatchery steelhead at LGD was estimated using the Salmonid Composition Bootstrap Intervals (SCOBI) script in the R computer program environment (R Development Core Team 2010), which produces a point-estimate and associated 90% confidence intervals (Ackerman In Review, and Kirk Steinhorst personal communication). In addition to COE window count data, one of the input files required to run the SCOBI analysis are the results of PBT analysis of all of the samples collected from ad-intact fish put into time-series strata. The goal is to include 100 to 200 samples in each time stratum that are at least one week long. The final results of the analysis provide escapement estimates of ad-clipped and ad-intact fish of hatchery origin within each time stratum (Table 8). The estimated total escapement of hatchery fish to LGD for spawn-year 2015 was 110,408 (± 1,087) ad-clipped fish and 9,394 (± 521) ad-intact fish (Bill Schrader, IDFG unpublished data).

Decomposing Hatchery Steelhead into Hatchery of Origin, Stock, and Cohort— During the period between July 1, 2014 and June 30, 2015, tissue samples were systematically collected from 1,563 ad-clipped hatchery steelhead and 875 ad-intact hatchery steelhead. Because ad-clipped and ad-intact steelhead were sampled at different rates, we analyzed the composition of the ad-clipped and ad-intact hatchery return separately. The hatchery escapement was decomposed into hatchery of origin, stock, and cohort using the *resampit.r* script performed in the R programming environment (R Development Core Team 2010). The *resampit.r script* was written and provided by M. Ackerman (PSMFC, Eagle Fish Genetics Lab). The program script resamples (bootstraps) with replacement from the original PBT assignment data set. The sample size for each iteration was equal to the number of samples in the dataset. Stock frequencies for each stock/cohort in each iteration were then divided by the PBT tagging rate (to account for untagged fish) for that stock to estimate the true number of fish from each stock within the mixture. Finally, the expanded stock assignments were then divided by the number of samples in the original dataset to estimate stock proportions. We performed 5,000 iterations and the 95% confidence intervals were then generated by removing $\alpha/2$ proportions from the extremes of the 5,000 ordered stock proportions.

Decomposition of Ad-clipped Hatchery Steelhead— We subsampled 1,022 out of the 1,562 biosamples collected at LGD using methods that most equitably represented the run. The entire run was broken down into four time strata from which subsamples were selected. Since a selection of 1,000 samples represents 0.9% of the window count of ad-clipped fish, this rate was applied to determine how many samples to include from each time strata. During the first time strata, beginning on July 1 and ending on September 21, 2014, a total of 194 PBT samples were collected and included in the analysis. Although this stratum encompassed the trap closure from July 7 through August 6, 2014, enough samples were collected to account for 0.9% of the estimated escapement of hatchery origin ad-clipped fish during that time period (Table 8). Samples selected from the following two time strata represent the peak of the run and accounted for 0.9% of the estimated escapement. Biosamples representing the time stratum after the trap reopened on March 10, 2015 accounted for 0.8% of the run passing LGD during that time period. Processing of the biosamples resulted in the assignment of 993 samples to 27 release groups that are categorized by rearing hatchery, stock, cohort; whereas 29 (2.8%) did not assign to a release group after accounting for the expanded PBT tag rates of each of the 27 groups (Table 9).

Assignments to the baseline include 276 samples from Oregon and Washington releases. Stocks assigned to Oregon include Little Sheep Creek of the Imnaha River (LSC) and Wallowa River of the Grande Ronde River (WAL). Stocks assigned to Washington releases include Cottonwood Creek of the Grande Ronde River (CGR), and Lyon's Ferry localized broodstock (LYF). Unassigned samples are most likely the result of broodstock not being sampled, lost samples, out of basin strays from broodstock not in the hatchery baseline, or failure of processed samples to result in a useable genotype.

The largest number (~52%) of ad-clipped steelhead arriving at LGD this run year were age four (2-ocean) fish released as smolts in 2012 (Table 10). Releases from Niagara Springs made up 21% of the combined return. Clearwater River basin releases from Dworshak and from Clearwater made up 23% of the return. Releases from Hagerman made up 10% of the return and releases from Magic Valley made up 13% of the return. Releases from Oregon made up 15% and releases from Washington made up 12% of the return.

Decomposition of Unclipped Hatchery Steelhead—Of the 4,882 samples taken from ad-intact steelhead at LGD, 875 of them were from fish of hatchery origin, identified by the presence of a CWT, eroded fins, or by genetically assigning to the hatchery baseline. The resulting sample rate for the entire run of ad-intact fish of hatchery origin was 9.3% (Table 8). Of the 875 samples analyzed, 766 samples assigned to 31 hatchery/stock/cohort groups. After accounting for the expanded PBT tag rates of each of the 31 groups, the total number of samples that could be assigned increased to 829 resulting in a 95% assignment rate (Table 11). Most of the ad-intact hatchery origin steelhead returning to LGD are 3,405 fish from Clearwater releases and 2,588 fish from Hagerman releases (Table 12). The two PAH stock samples from Magic Valley and the five OX and PAH stock samples from Niagara Springs are misclips as there are no intentionally released adipose intact fish from these facilities.

Table 8. Sampling strategy for the selection of bio-samples collected at LGD for age and stock composition analysis of the hatchery origin adult steelhead escapement at the dam.

Trapping Strata	Begin Date	End Date	Trap Closures	Hatchery Origin Ad-Clipped			Hatchery Origin Ad-Intact		
				Escapement Estimate	Sample Size	Sample Rate	Escapement Estimate	Sample Size	Sample Rate
1	7/1/2014	9/21/2014	7/7-8/6	22,050	194	0.9%	1,430	128	9.0%
2	9/22/2014	10/12/2014	-	58,966	561	0.9%	4,770	481	10.1%
3	10/13/2014	12/28/2014	11/12-12/28	24,889	231	0.9%	2,694	238	8.8%
	12/29/2014	3/4/2015		Ladder Closed					
4	3/5/2015	6/30/2015	3/5-3/9	4,503	36	0.8%	500	28	5.6%
Totals				**110,408**	**1,022**	**0.9%**	**9,394**	**875**	**9.3%**

Table 9. Assignment results of PBT subsamples taken from one-, two-, and three-ocean (Brood years 2012, 2011, and 2010) ad-clipped adult steelhead of hatchery origin at the Lower Granite Dam trap during the 2014-15 run.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Dworshak	DWOR	18	174		192
Clearwater	DWOR		36	1	37
	SFCR	1	5	1	7
Hagerman	SAW	117	44		161
Magic Valley	USAL	1	32		33
	PAH	49	21		70
	SAW		4		4
Niagara Springs	OX	13	57		70
	PAH	110	32	1	143
Lyon's Ferry WA	CGR	55	25		80
	LYF	18	21		39
Wallowa OR	LSC	22	17		39
	WAL	54	64		118
Unassigned					29
Total		**458**	**532**	**3**	**1,022**

Table 10. Summary of escapement point-estimates for one-, two-, and three-ocean (Brood years 2012, 2011, and 2010) ad-clipped hatchery steelhead returning to LGD during the 2014-15 run, based on analysis of PBT samples. The range in parenthesis represents the 95% confidence interval.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Dworshak	DWOR	1,912 (1,125-2,812)	18,771 (16,246-21,406)		20,683
	Total	**1,912**	**18,771**		**20,683**
Clearwater	DWOR		3,952 (2,744-5,269)	112 (1-335)	4,064
	SFCR	110 (1-329)	505 (126-1,009)	108 (1-324)	722
	Total	**110**	**4,456**	**220**	**4,786**
Hagerman	SAW	12,652 (10,597-14,815)	4774 (3,472-6,184)		17,426
	Total	**12,652**	**4,774**		**17,426**
Magic Valley	DWOR	112 (1-337)	3,513 (2,305-4,720)		3,625
	PAH	5,289 (3,857-6,832)	2,316 (1,226-3,407)		7,606
	SAW		434 (108-868)		434
	Total	**5,402**	**6,263**		**11,665**
Niagara Springs	OX	1,428 (659-2,198)	6,111 (4,583-7,756)		7,539
	PAH	11,901 (9,808-14,105)	3,407 (2,180-4,769)	111 (1-334)	15,419
	Total	**13,330**	**9,517**	**111**	**22,959**
Lyon's Ferry WA	CGR	5,948 (4,434-7,461)	2,704 (1,690-3,831)		8,652
	LYF	1,946 (1,081-2,814)	2,271 (1,406-3,244)		4,217
	Total	**7,894**	**4,975**		**12,869**
Wallowa OR	LSC	2,376 (1,358-3,394)	1,838 (973-2,703)		4,214
	WAL	5,779 (4,361-7,305)	6,928 (5,389-8,688)		12,707
	Total	**8,155**	**8,767**		**16,921**
Unassigned		3,096 (1,518-4,740) (includes all age groups)			3,099
Grand Total		**49,454**	**57,523**	**331**	**110,408**

Table 11. Assignment results of PBT samples taken from one-, two-, and three-ocean (Brood years 2012, 2011, and 2010) ad-intact adult steelhead of hatchery origin at the Lower Granite Dam trap during the 2014-15 run.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Dworshak	DWOR	4	146	1	151
Clearwater	DWOR	17	124	3	144
	SFCR	10	163		173
Hagerman	EFNAT	67	125		192
	SAW	6	43		49
Magic Valley	USAL	8	40		48
	PAH	1	1		2
Niagara Springs	OX	1	2		3
	PAH	1	1		2
Sho-Ban Egg Box	PAH		3	1	4
Lyon's Ferry WA	CGR	1	2		3
	LYF	1	1		2
	TOU	1			1
	TUC	20	32		52
Wallowa OR	WAL	2	1		3
Unassigned					46
Total		140	684	5	875

Table 12. Summary of escapement point-estimates for one-, two-, and three-ocean (Brood years 2012, 2011, and 2010) ad-intact hatchery steelhead returning to LGD, based on analysis of PBT samples. The range in parenthesis represents the 95% confidence interval.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Dworshak	DWOR	45 (11-89)	1,569 (1,341-1,809)	11 (1-33)	1,625
	Total	**45**	**1,569**	**11**	**1,625**
Clearwater	DWOR	179 (101-268)	1,330 (1,123-1,558)	33 (3-78)	1,542
	SFCR	109 (43-174)	1,754 (1,491-2,017)		1,863
	Total	**288**	**3,084**	**33**	**3,405**
Hagerman	EFNAT	719 (548-890)	1,342 (1,127-1,567)		2,061
	SAW	64 (21-118)	463 (323-603)		527
	Total	**783**	**1,805**		**2,588**
Magic Valley	USAL	89 (55-123)	426 (149-703)		515
	PAH	11 (1-33)	14 (1-41)		25
	Total	**100**	**440**		**540**
Niagara Springs	OX	11 (1-33)	23 (2-58)		34
	PAH	11 (1-33)	14 (1-41)		25
	Total	**22**	**37**		**59**
Sho-Ban Egg Box[1]	PAH		27 (3-67)	11 (1-32)	38
	Total		**27**	**11**	**38**
Lyon's Ferry WA	CGRW	11 (1-32)	22 (2-56)		33
	LYF	11 (1-32)	11 (1-32)		22
	TOU	12 (1-37)			12
	TUC	218 (109-346)	337 (153-552)		555
	Total	**252**	**370**		**622**
Wallowa OR	WAL	22 (2-54)	11 (1-33)		33
	Total	**22**	**11**		**33**
Unassigned		486 (225-751) (includes all age groups)			486
Grand Total		**1,513**	**7,342**	**55**	**9,396**

[1] Actual ocean age of progeny reared and released in egg boxes is not known, only the total age is known (i.e. total age of a 1-Ocean fish in this table is three years).

Comparison of Estimates Based on PIT Tag Detections and PBT Analysis—The two methods of using PIT tag expansions and PBT analysis for estimating stock and cohort composition of the adult escapement over LGD are independent of each other and expected to differ slightly. Estimates derived from PIT tag detections provided in Table 7 were broken down into ad-clipped and ad-intact groups for comparison against estimates derived from PBT analysis (Figures 3 and 4). There were 29 separate ad-clipped and ad-intact release groups represented by PIT tags that were also represented by PBT release groups in the comparison. There were 22 (76%) PIT tag based escapement estimates that were less than the PBT estimates. Of the 22, nine (31%) were significantly lower than the 95% confidence interval of the PBT estimate. Both methods of estimating the stock composition of escapement have potential for bias. For estimates based on PIT tag detections, the expansion values underrepresent the population if PIT tags are shed, if there is differential mortality between tagged and untagged fish within the same release group, or a combined effect of the two factors. Camacho et al. (2017) lists potential sources of bias in the development of escapement estimates based on window counts and analysis of PBT sample data, including unaccounted for fallback and reascension of fish counted at the ladder.

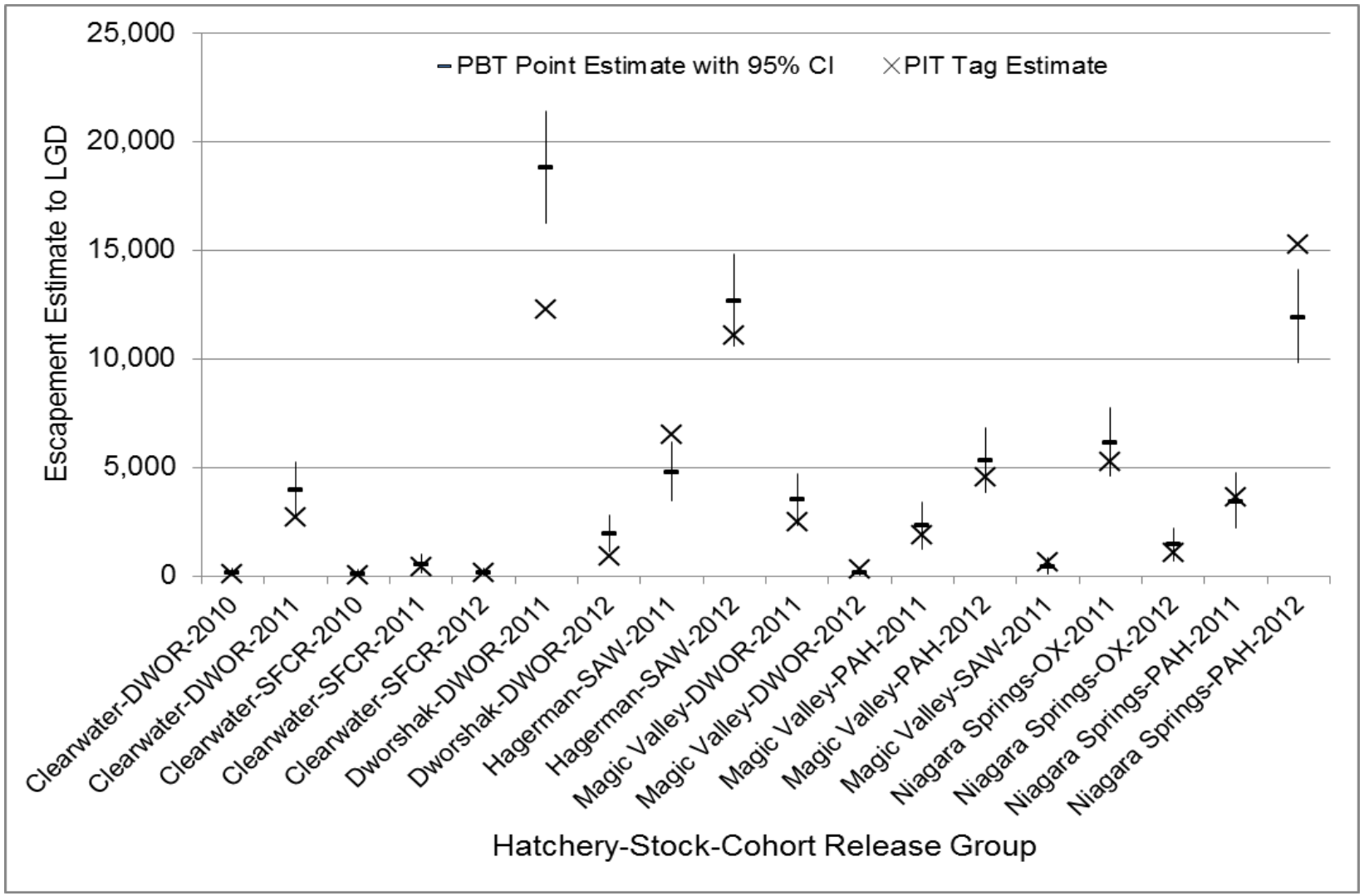

Figure 3. Hatchery steelhead escapement to LGD with estimates derived from PBT analysis (with 95% C.I.) of samples from ad-clipped fish and PIT tag expansions of ad-clipped release groups.

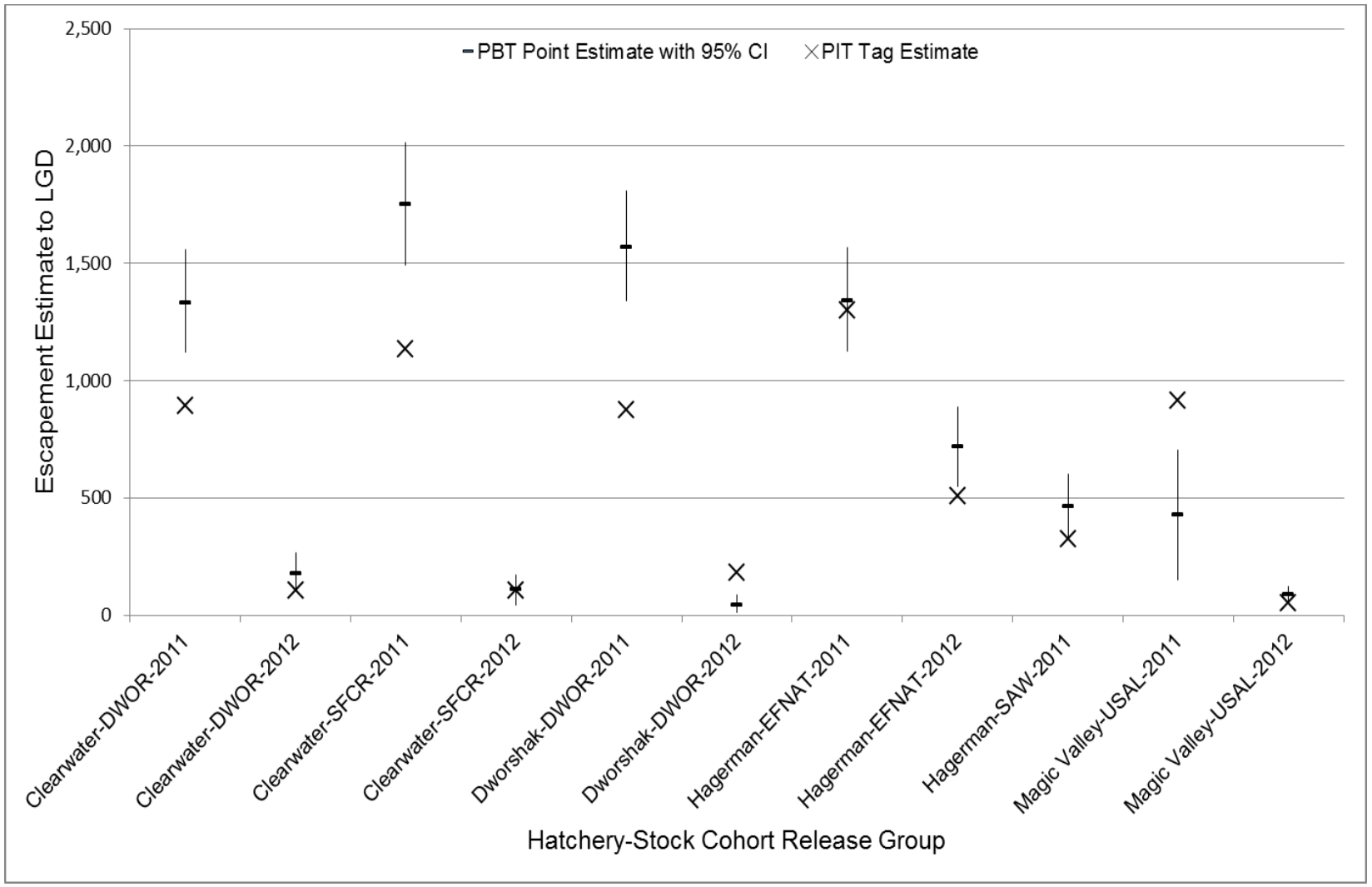

Figure 4. Hatchery steelhead escapement to LGD with estimates derived from PBT analysis (with 95% C.I.) of samples from ad-intact fish and PIT tag expansions of ad-intact release groups.

Conversion Rates Between Dams

Conversion rates from Bonneville to McNary dam and from Bonneville to LGD were based on detections of PIT-tagged adult hatchery steelhead. Tables 13 and 14 provide the number of tags detected, which are grouped by stock, release basin, and brood year for three cohorts. For the purposes of this report, PIT tag detections include all sort-by-code categories (Run-at-Large and Return-to-River) and conversion rates represent all losses between dams, including harvest, strays, and mortalities. Conversion rates from Bonneville to McNary dam ranged from 78% to 100% for 1-ocean fish and 70% to 92% for 2-ocean fish. Conversion rates from Bonneville to LGD ranged from 67% to 100% for 1-ocean fish and from 59% to 81% for 2-ocean fish. All of the groups that had a 100% conversion rate in both tables were based on the detection of three or fewer tags.

Table 13. Total number of PIT-tagged adult hatchery steelhead detected in the Columbia River hydropower system and the conversion rate from Bonneville to McNary dam during the 2014-15 run.

River Basin	1-Ocean			2-Ocean			3-Ocean			
Stock	Bonneville	McNary	Conversion	Bonneville	McNary	Conversion	Bonneville	McNary	Conversion	Weighted Average
Clearwater River										
DWOR	24	22	92%	265	212	80%	1	1	100%	81%
SFCR	9	8	89%	49	40	82%	1	1	100%	83%
Salmon River										
DWOR	12	11	92%	71	51	72%	2	2	100%	75%
EFNAT	45	35	78%	50	43	86%				82%
OX				46	34	74%				
PAH	294	241	82%	159	111	70%				78%
SAW	270	211	78%	103	78	76%	1	1	100%	78%
USAL	3	3	100%	53	49	92%				93%
Snake River										
OX	19	17	89%	65	49	75%				79%
PAH	78	66	85%							85%

Table 14. Total number of PIT tagged adult hatchery steelhead detected in the Columbia River hydropower system and the conversion rate from Bonneville to Lower Granite Dam (LGD) during the 2014-15 run.

River Basin	1-Ocean			2-Ocean			3-Ocean			
Stock	Bonneville	LGD	Conversion	Bonneville	LGD	Conversion	Bonneville	LGD	Conversion	Weighted Average
Clearwater River										
DWOR	24	22	92%	265	202	76%	1	1	100%	78%
SFCR	9	8	89%	49	39	80%	1	1	100%	81%
Salmon River										
DWOR	12	10	83%	71	42	59%	2	1	50%	62%
EFNAT	45	30	67%	50	38	76%				72%
OX				46	32	70%				70%
PAH	294	222	76%	159	98	62%				71%
SAW	270	194	72%	103	70	68%	1	1	100%	71%
USAL	3	3	100%	53	43	81%				82%
Snake River										
OX	19	17	89%	65	46	71%				75%
PAH	78	54	69%							69%

Run Timing

Stock specific run timing curves were generated for steelhead passage at Bonneville Dam and LGD by graphing the cumulative percentage of the return by date based on PIT tag detections in the adult ladders. The run timing difference between A-run and B-run type stocks is clearly visible at Bonneville in Figure 5; B-run stocks (DWOR, SFCR and USAL) arrive approximately one month later than A-run stocks (EFNAT, OX, PAH, and SAW). Run timing differences are less pronounced but still noticeable at LGD, where upriver migration is likely influenced by in-river conditions including water temperatures (Figure 6). The USAL adults produced from releases in the upper Salmon River continue to follow a pattern of returning later than DWOR adults returning from releases in the Clearwater River. This is a pattern that has been observed the previous four runs (Warren et al. 2016).

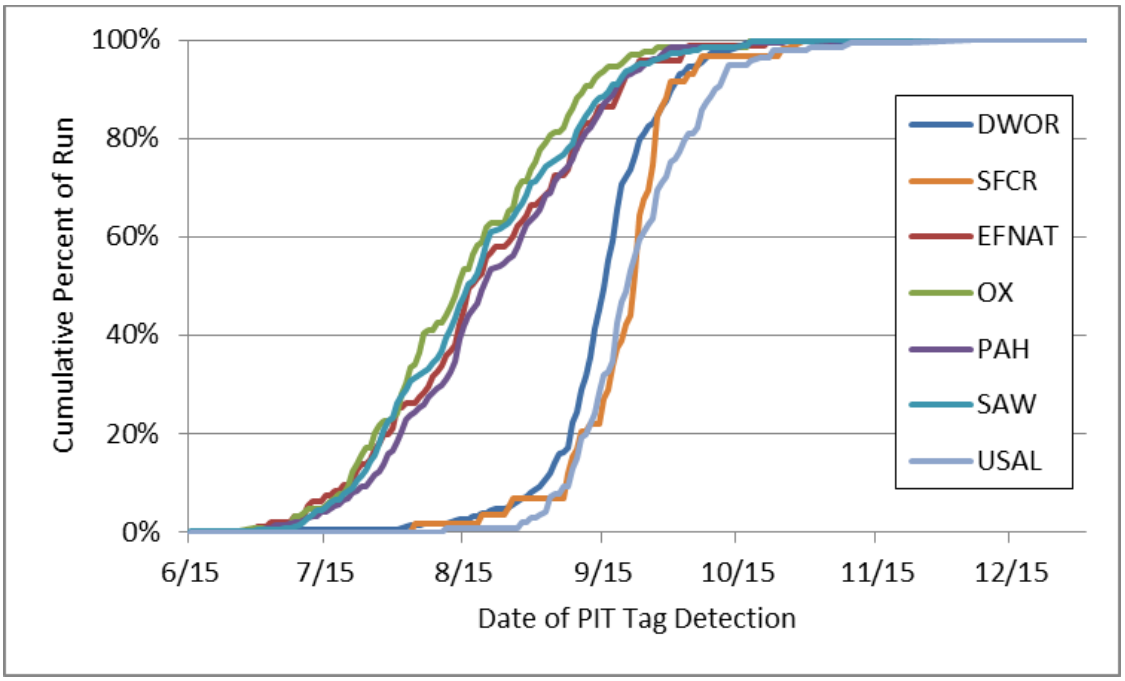

Figure 5. Run timing of hatchery steelhead at Bonneville based on PIT tag detections during the 2014-2015 run.

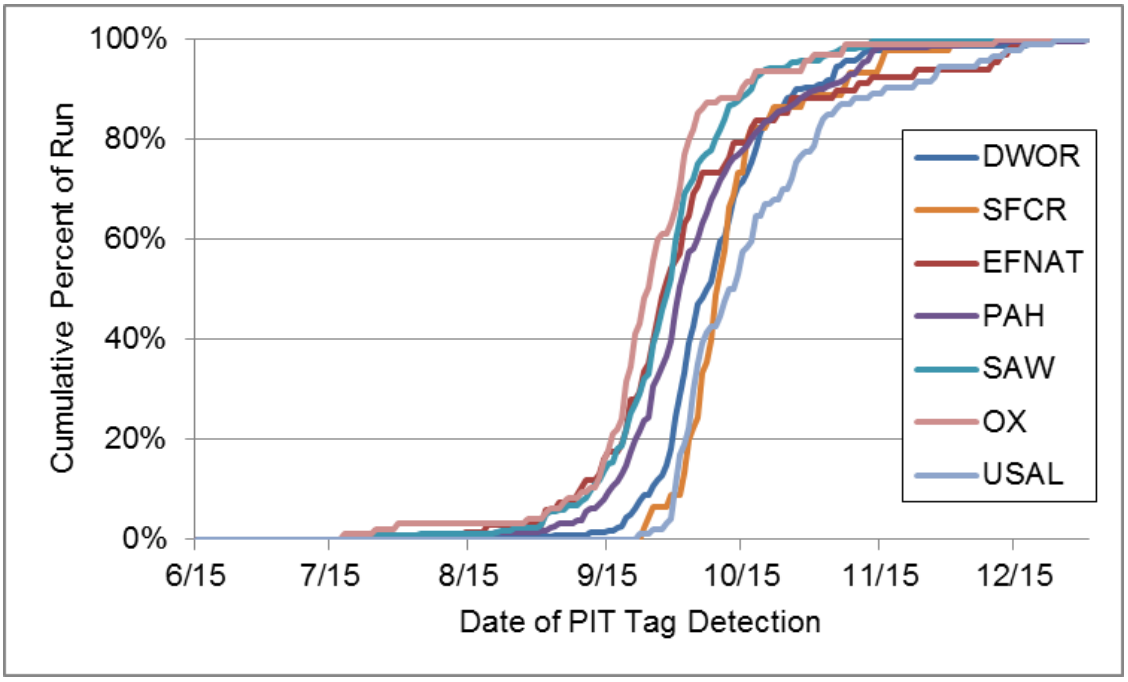

Figure 6. Run timing of hatchery steelhead at LGD based on PIT tag detections during the 2014-2015 run.

Idaho Recreational Fisheries

Harvest surveys (mail and telephone) are conducted to estimate statewide harvest (SWH) and angler effort in steelhead fisheries after the conclusion of each season (fall and spring). Results of the SWH survey indicate that anglers harvested 22,972 hatchery steelhead during the fall season of 2014 and 20,497 hatchery steelhead during the spring season of 2015 in Idaho. This information is summarized for each river section (Figure 7) and season combination (stratum) (Table 15). For the purposes of this analysis, several adjacent river sections are combined into stratum. Hatchery of origin and stock composition of the catch from each stratum are based on the results of angler surveys conducted by roving creel survey personnel gathering information from anglers and their catch throughout the fishing season. No creel surveys were conducted in Hells Canyon Reservoir (River Stratum 27) or the Boise River (River Stratum 28) because steelhead caught in those strata are fish transplanted from the Hells Canyon trap. Data gathered during these surveys include the collection of CWT from tagged fish and fin clips for PBT information. Assignment of tissue samples to the PBT baseline are made on a subsample from the pool of samples taken during the creel surveys. These data are used in conjunction with the SWH survey results for stock specific harvest estimates within various strata. The acquisition of CWT and PBT data each provides an independent estimate of the stock composition of the harvest and enables us to compare the two methods. With both methods the composition of the harvest is estimated by the total number of tagged fish sampled and the number of fish that each recovered tag represents (expansion value). Since brood year 2012 is the last cohort of smolts with CWTs for the purpose of harvest estimation, this is the last year a comparison of the two methodologies will be made. Estimating the composition of the harvest requires acquiring a large enough sample of fish from the population to assure that all stocks within the fishery are represented in the sample. Since more than 95% of all smolts released are PBT tagged, there is a higher probability of representing all stocks and cohorts in the sample.

For the fall season, 856 CWTs and 942 PBT samples from eight strata were used in the analysis of the stock composition. No angler surveys to collect CWTs or PBT samples were conducted in the South Fork Clearwater River (River Stratum 07), or upper Salmon River (River Stratum 18-19) during the fall of 2014, where angler effort is generally low. The small numbers of CWTs and PBT samples acquired from River Stratum 07 came from incidental angler contacts and voluntarily contributed samples. The distribution of PBT samples collected and used in the analysis was more spatially balanced across strata compared to CWT samples. For example, 47% of all the CWT samples collected in the fall fishery came from a single stratum whereas the PBT samples used in the analysis were evenly distributed across all strata (see Appendix C for a complete list of CWT and PBT samples used in the analysis for each strata). Stock composition estimates of the fall harvest based on the recoveries of CWT and analysis of PBT samples are provided in Table 16. Results using either methodology indicate that approximately 58% of the fall harvest was on Snake River (OX) and Salmon River (PAH, SAW, and USAL) stocks from the Salmon River drainage. Harvest of Clearwater stocks made up approximately 30% of the fall harvest, almost all of which occurred within the lower Clearwater River and North Fork Clearwater River strata. The stock composition of the fall fishery in River Stratum 2 and River Stratum 3-4 contains a mix of release groups including some that were out of the direct path to their release site. The lower reach of River Stratum 2 on the Snake River is at the confluence with the Salmon River and it is not unexpected that fish harvested in River Section 2 would include some Salmon River, Imnaha (IMNA), Grande Ronde (GR) and Lyons Ferry (LYON) stock fish. Likewise, the downstream end of River Stratum 3 on the Clearwater River is at the confluence with the Snake River, and Salmon River stocks harvested from within River Stratum 3-4 may be seeking temporary thermal refuge in the lower Clearwater River during the early part of their migration. Given that very few Salmon River fish are recovered in the Clearwater during the spring fishery,

it is likely that the majority of these fish utilizing the lower Clearwater River in the fall resume migration back to the location of release prior to spawning.

For the spring season, 441 CWTs and 1,392 PBT samples from nine strata were used in the analysis of the stock composition. As expected, the spring harvest was more dispersed between strata within the Clearwater and Salmon river drainage strata compared to the fall harvest as fish moved into the terminal areas (Table 17). Fewer fish were also harvested outside their migration corridor between LGD and their location of release during the spring fishery.

Harvest data based on the analysis of PBT samples was combined for the fall and spring steelhead fishing seasons to provide age composition of the harvest by rearing hatchery and stock. Results indicate that 39.4% of the statewide harvest were age-3 (1-Ocean) fish, and 60.6% were age-4 (2-Ocean) and less than 0.1% were age-5 (3-Ocean) fish (Table 18).

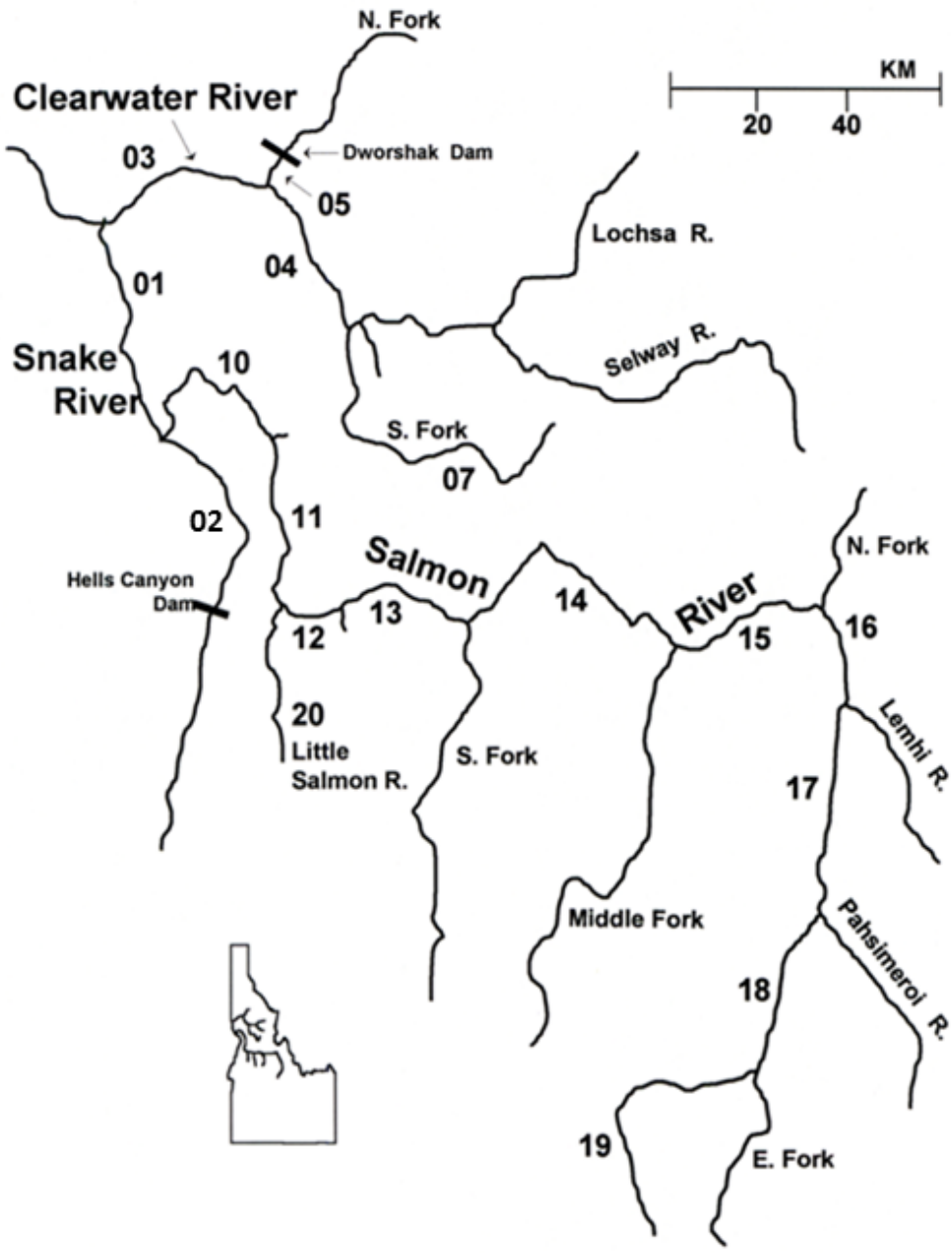

Figure 7. Idaho Department of Fish and Game river section designations where hatchery steelhead are available for harvest. Major tributaries or dams indicated on the map are used as section boundaries.

Table 15. Adult steelhead harvest estimated from statewide angler survey after the close of the 2014-15 fishing season.

Location Stratum	Location Code (River Section)	Location Description	Fall Effort (Angler days)	Spring Effort (Angler Days)	Fall Harvest	Spring Harvest	Total Harvest
01	01	Snake R.; State Line to Salmon R.	9,555	3,999	2,782	648	3,430
02	02	Snake R.; Salmon R. to Hells Canyon Dam	3,999	957	1,365	583	1,948
03-04	03	Clearwater R.; Mouth to N.Fk.	30,756	11,163	5,632	3,275	8,907
	04	Clearwater R.; N. Fk. to S. Fk.	4,638	6,838	685	1,686	2,371
05	05	N. Fk. Clearwater R.	4,112	5,311	643	2,085	2,728
07	07	S. Fk. Clearwater R.	3,061	11,128	116	2,133	2,249
10-12	10	Salmon R.; Mouth to Whitebird Cr.	3,568	1,631	939	397	1,336
	11	Salmon R.; Whitebird Cr. To Little Salmon R.	8,203	3,535	1,659	918	2,577
	12	Salmon R.; Little Salmon R. to Vinegar Cr.	6,135	1,685	1,902	365	2,267
13-17	13	Salmon R.; Vinegar Cr. To S. Fk. Salmon R.	1,972	1,138	429	72	501
	14	Salmon R.; S. Fk. Salmon R. to Middle Fk. Salmon R.	4,406	2,415	669	386	1,055
	15	Salmon R.; Middle Fk. Salmon R. to N. Fk. Salmon R.	12,759	7,696	2,934	2,000	4,934
	16	Salmon R.; N. Fk. Salmon R. to Lemhi R.	6,470	3,971	986	732	1,718
	17	Salmon R.; Lemhi R. to Pahsimeroi R.	4,362	5,718	857	573	1,430
18-19	18	Salmon R.; Pahsimeroi R. to E. Fk. Salmon R.	1,260	4,245	122	478	600
	19	Salmon R.; E. Fk. Salmon to Sawtooth	1,913	5,872	151	1,006	1,157
20	20	Little Salmon R.	2,158	5,394	437	2,855	3,292
27	27	Hells Canyon Reservoir [1]	590	418	223	295	518
28	28	Boise River [1]	4,549	455	441	10	451
		Statewide Total:	**109,327**	**82,696**	**22,972**	**20,497**	**43,469**

[1] Recreational fishery created by transplanting adult steelhead from Hells Canyon Dam trap facility.

Table 16. A comparison of estimates of the adult steelhead stock composition between CWT recoveries and PBT analysis from fish harvested in the fall of 2014.

Hatchery	Stock	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19[1]	Little Salmon Sect. 20	Total Harvest
Dworshak	DWOR	CWT	87	-	4,395	643	-	-	-	-	-	5,124
		PBT	68	-	3,945	576	-	-	-	-	-	4,588
Clearwater	DWOR	CWT	15	-	1,178	-	116	-	-	-	-	1,309
		PBT	-	-	913	34	54	-	-	-	-	1,001
	SFCR	CWT	3	-	48	-	-	-	-	-	-	51
		PBT	-	-	162	-	62	-	-	-	-	224
Hagerman	SAW	CWT	235	71	9	-	-	224	2,859	-	-	3,398
		PBT	232	-	72	-	-	125	2,419	-	-	2,847
Magic Valley	USAL	CWT	98	8	39	-	-	334	348	-	-	827
		PBT	151	-	-	-	-	533	454	-	70	1,207
	PAH	CWT	139	18	19	-	-	906	680	-	128	1,889
		PBT	143	-	-	-	-	881	595	-	297	1,932
	SAW	CWT	6	-	-	-	-	-	186	-	-	192
		PBT	-	-	36	-	-	-	64	-	-	100
Niagara Springs	OX	CWT	219	463	37	-	-	944	447	-	-	2,110
		PBT	324	521	114	-	-	786	691	-	-	2,434
	PAH	CWT	577	332	58	-	-	1,642	1,355	-	309	4,273
		PBT	615	275	82	-	-	1,819	1,652	-	70	4,510
Irrigon OR	IMNA OR	CWT	428	420	154	-	-	431	-	-	-	1,432
		PBT	358	351	224	-	-	255	-	-	-	1,185
	GR OR	CWT	538	52	106	-	-	20	-	-	-	716
		PBT	385	74	145	-	-	25	-	-	-	628
Cottonwood WA	GR WA	CWT	357	-	61	-	-	-	-	-	-	418
		PBT	304	33	72	-	-	76	-	-	-	483
Lyons Ferry WA	LYON WA	CWT	76	-	192	-	-	-	-	-	-	268
		PBT	165	-	395	-	-	-	-	-	-	559

Hatchery	Stock	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19[1]	Little Salmon Sect. 20	Total Harvest
Tucannon WA	TUC WA	CWT	-	-	6	-	-	-	-	-	-	6
Umatilla OR	UMAT OR	CWT	4	-	17	-	-	-	-	-	-	21
Unassigned	Unassigned	PBT	36	111	158	33	-	-	-	-	-	338
Harvest Estimate			**2,781**	**1,365**	**6,317**	**643**	**116**	**4,500**	**5,875**	**-**	**437**	**22,034**

[1] No creel surveys were conducted to collect samples from angler harvested fish in river sections 18-19 during the fall of 2014.

Table 17. A comparison of estimates of the adult steelhead stock composition between CWT recoveries and PBT analysis from fish harvested in the spring of 2015.

Hatchery	Stock	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19	Little Salmon Sect. 20	Total Harvest
Dworshak	DWOR	CWT	-	-	4,359	2,053	1,164	-	-	-	-	7,576
		PBT	10	3	4,113	1,871	996	-	-	-	-	6,994
Clearwater	DWOR	CWT	-	-	598	25	873	-	-	-	-	1,497
		PBT	-	-	563	125	780	-	-	-	-	1,468
	SFCR	CWT	-	-	4	-	96	8	-	-	-	108
		PBT	-	-	97	-	221	-	-	-	-	318
Hagerman	SAW	CWT	-	5	-	-	-	149	1,452	1,469	-	3,075
		PBT	10	7	-	-	-	99	1,502	1,451	-	3,069
Magic Valley	PAH	CWT	20	-	-	-	-	302	797	-	518	1,638
		PBT	20	-	-	-	-	240	422	8	747	1,437
	SAW	CWT	-	-	-	-	-	22	46	15	-	82
		PBT	-	-	-	-	-	9	-	-	-	9
	USAL	CWT	15	39	-	-	-	289	329	-	245	917
		PBT	39	14	28	18	-	413	293	25	355	1,184
Niagara Springs	OX	CWT	51	95	-	-	-	85	-	-	468	699
		PBT	11	111	-	-	-	98	89	-	544	853
	PAH	CWT	327	257	-	-	-	749	1,140	-	1,623	4,097
		PBT	209	231	28	-	-	659	1,305	-	1,210	3,642
Irrigon OR	GR OR	PBT	49	3	28	-	-	28	21	-	-	129
	IMNA OR	CWT	151	187	-	-	-	76	-	-	-	413
		PBT	199	141	-	-	-	74	-	-	-	414
Cottonwood WA	GR WA	CWT	84	-	-	-	-	-	-	-	-	84
		PBT	69	7	-	-	-	9	-	-	-	84
Tucannon WA	Tucannon WA	CWT	-	-	-	7	-	-	-	-	-	7
Unassigned	Unassigned	PBT	34	67	104	71	135	50	131	-	-	591
Harvest Estimate			**648**	**583**	**4,961**	**2,085**	**2,133**	**1,680**	**3,763**	**1,484**	**2,855**	**20,192**

Table 18. Total estimated harvest of adult steelhead by rearing hatchery, stock, and age group during the fall of 2014 and the spring of 2015.

Hatchery	Stock	1-Ocean	2-Ocean	3-Ocean	Total
Clearwater	DWOR	97	2,658		2,755
	SFCR	45	451		496
Clearwater Total		**142**	**3,109**		**3,251**
Dworshak	DWOR	1,039	10,339		11,378
Dworshak Total		**1,039**	**10,339**		**11,378**
Hagerman	SAW	4,786	1,674	6	6,466
Hagerman Total		**4,786**	**1,674**	**6**	**6,466**
Lyons Ferry	CGR	354	193		548
	LYON	342	238		580
Lyons Ferry Total		**696**	**431**		**1,128**
Magic Valley	DWOR	248	2,060		2,308
	PAH	2,000	1,161		3,161
	SAW		93		93
Magic Valley Total		**2,248**	**3,314**		**5,562**
Niagara Springs	OX	184	2,627		2,811
	PAH	5,841	2,598	19	8,457
Niagara Springs Total		**6,025**	**5,224**	**19**	**11,268**
Wallowa	LSCR	977	553		1,530
	WALL	364	390		754
Wallowa Total		**1,341**	**943**		**2,284**
Unassigned					874
Grand Total		**16,278**	**25,034**	**24**	**42,210**

Hatchery Trap Returns

Daily trapping numbers were used to summarize the run timing for hatchery and natural origin fish collected in hatchery traps. Arrival timing at Hells Canyon Dam was not included, as the trap is operated intermittently (primarily in the fall) and would not show representative run timing. South Fork Clearwater River broodstock are collected by an angler contribution program and are therefore also not represented. Figures 8 and 9 summarize the run timing of steelhead returning to hatchery traps in the upper Salmon River in 2015.

Table 19 summarizes the age composition, origin, average fork lengths, and the total number of adult steelhead trapped at each of the four trapping facilities operated by IDFG. The proportion of fish in each age group was estimated from the statistical computer program *R* (R Development Core Team 2010) with the *mixdist* library package (Macdonald 2010). The *mixdist* program, called *Rmix*, is used to estimate the parameters of a mixture distribution with overlapping components, such as the overlapping length distributions associated with adult steelhead returns composed of multiple age classes, and applies the maximum likelihood estimation method to a population based on a known-age subsample. The subsample of known age and fork length data used as input parameters for the program is acquired from the genotyping of broodstock and subsequent assigning to the PBT baseline. If known age information is not available through PBT analysis, then age composition is estimated using the FAO-ICLARM Stock Assessment Tools (FiSAT) II software (Gayanilo et al. 2005). This method also applies the maximum likelihood concept and provides an estimated proportion of fish for each age class that is used to estimate the number of fish in each age class. In some cases, where neither program could be used because of few returning adults, an age was assigned by applying a length cutoff after visually reviewing length frequencies. An example of where age data is not available from either PBT or CWT recoveries is the East Fork Salmon River trapping facility, where only fish of natural origin are used for broodstock and fish of hatchery origin are released back into the river to spawn naturally.

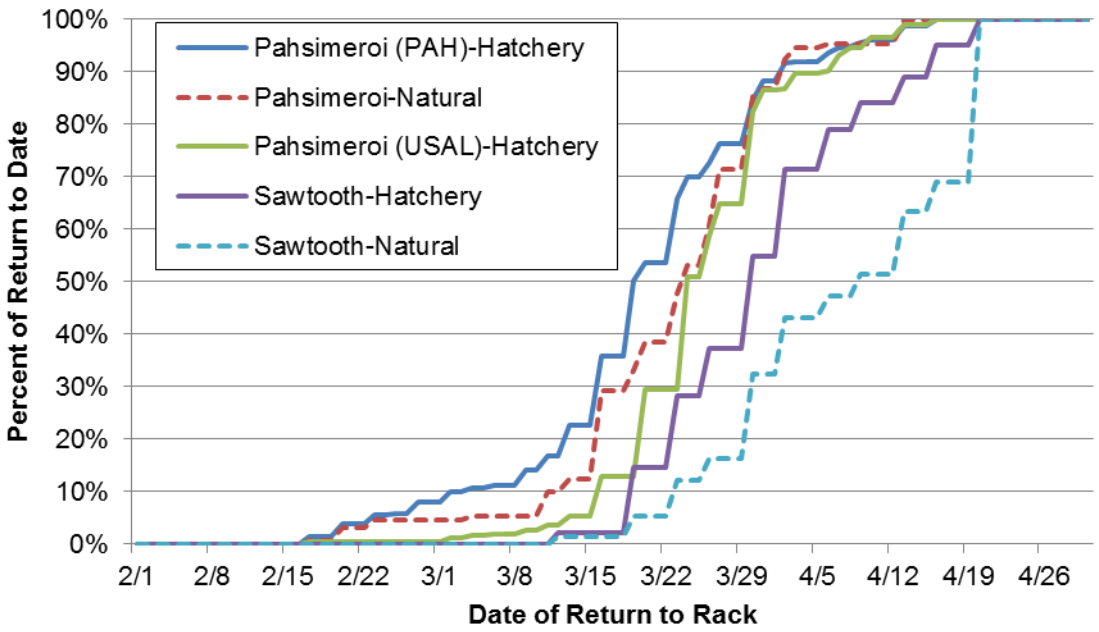

Figure 8. Run timing of adult hatchery and natural origin steelhead arriving at Pahsimeroi and Sawtooth Fish Hatchery traps in 2015.

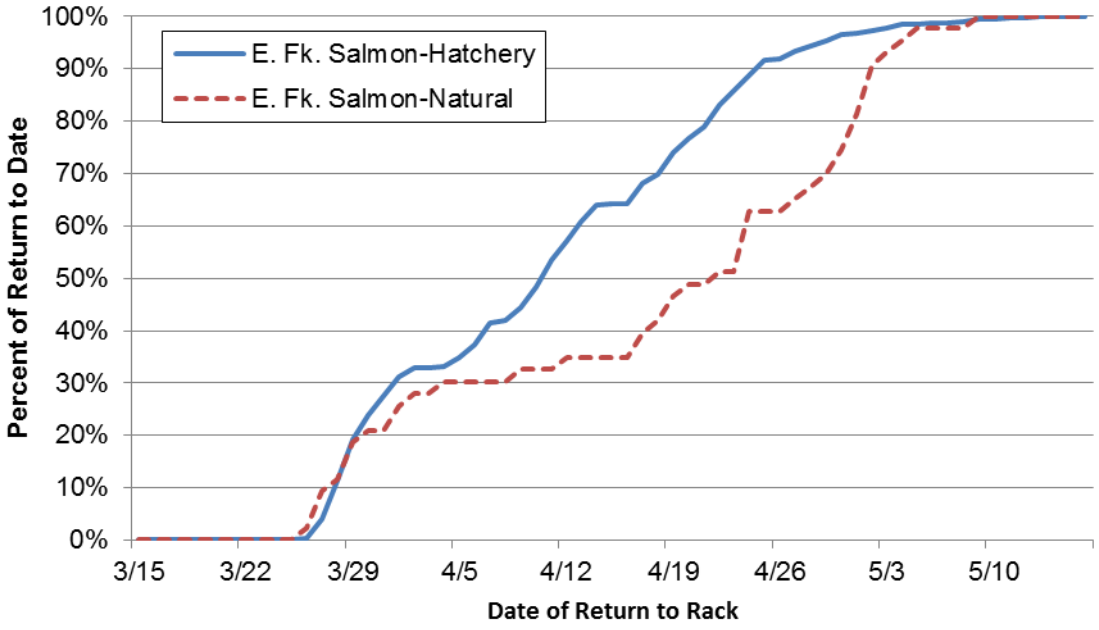

Figure 9. Run timing of adult hatchery and natural origin steelhead arriving at the East Fork Salmon River trap in 2015.

Table 19. Age composition and average fork length (cm) of adult steelhead returning to hatchery traps in 2015.

			Males				Females				
			One-ocean		Two-ocean		One-ocean		Two-ocean		
Hatchery Trap	Stock	Origin	Number Trapped	Average Length	Number Trapped	Average Length	Number Trapped	Average Length	Number Trapped	Average Length	Total Return
Sawtooth	SAW	H	1,487	58	639	70	819	56	904	66	3,849
		N	19	62	15	71	8	57	32	66	74
East Fork	EFNAT	H	384	56	138	72	105	56	238	70	865
		N	13	59	3	70	4	58	23	72	43
Pahsimeroi	PAH	H	1,565	55	245	70	935	55	857	67	3,602
		N	40	56	14	72	39	59	37	68	130
	USAL	H	50	62	129	78	3	60	228	74	410
Hells Canyon	OX	H	663	56	470	70	591	55	1,186	67	2,910
		N	21	57	38	67	61	61	35	70	155
Clearwater[1]	SFCR	H	-		118	84	-		227	800	345

[1] Clearwater adult steelhead acquired from anglers donating to SFCR localized broodstock program.

LOCALIZED BROODSTOCK DEVELOPMENT

East Fork Natural Program

The East Fork Salmon River Trap (EF weir) is a satellite facility of Sawtooth Fish Hatchery (SFH) and is utilized to collect broodstock for the EFNAT steelhead supplementation program. The goal of this hatchery program is to aid in the recovery of the natural steelhead population in the East Fork Salmon River by supplementing the natural spawning population.

Hatchery production and release goals were reduced from 160,000 smolts after migration year 2013 to 60,000 smolts in 2014. The hatchery production goal for migration year 2016 is to continue with a release of 60,000 integrated steelhead smolts into the East Fork Salmon River near the adult trap. To achieve this production goal, approximately 87,500 green eggs are needed from approximately 16 females. Naturally produced adults will be prioritized for inclusion into the broodstock but if insufficient natural adults are available, hatchery-origin adults will be included in the broodstock. All progeny released back into the East Fork Salmon River will be ad-intact with a CWT for later identification. An Annual Operating Plan summarizing the current year's broodstock and spawning protocols is jointly developed preseason by Nampa Fisheries Research staff and by SFH staff.

For the 2015 brood year, the trap was operated from March 26 through May 20. During this time 928 adult steelhead were trapped including 522 males and 343 females of hatchery origin (HO), 16 males and 27 females of natural origin (NO), and 20 fish that were identified as HO non-program strays. A total of 38 adult steelhead spawned at the trap facility, which included 15 females of NO, 8 males of HO, and 15 males of NO (Table 20). Fish released upstream of the trap include 532 males (524 HO, 8 NO) and 355 females (343 HO, 12 NO). The proportion of fish released upstream to spawn naturally that were HO was 97.7%. All HO non-program fish were killed and not used for spawning. Spawning activities yielded a total of 100,504 green eggs for an average fecundity of 6,700 eggs per female. A total of 92,025 eyed eggs were obtained for a 91.6% eye-up survival rate. Due to higher than expected fecundity and eyed egg survival, this year's production will likely exceed the release goal of 60,000 smolts, which will result in an evaluation and possible adjustment of future spawning goals for the program.

Table 20. Adult steelhead disposition at the East Fork Salmon River trap in 2015.

Disposition	HO Males	NO Males	HO Females	NO Females	Stray Males	Stray Females
Spawned killed	8	11	-	15	-	-
Spawned once then released above weir	-	4	-	-	-	-
Released above weir	514	8	342	12	-	-
Strays killed and not used	-	-	-	-	16	4
Pre-spawn morts	-	-	1	-	-	-
Total Trapped	**522**	**19**	**343**	**27**	**16**	**4**

Upper Salmon B-run Program

The development of a locally adapted hatchery stock in the upper Salmon River, which matures predominantly (approximately 90%) after two or more years in the ocean, began in 1997 with the release of DWOR stock smolts in Squaw Cr. Adults from these releases returned as two-ocean fish in 2002 and provided the founding stock (USAL) for the Upper Salmon B-run program. Returns of USAL stock adults are being evaluated annually with modifications made as needed to continue to further develop the program into a completely self-sustaining broodstock.

The USAL broodstock collection was shifted from Squaw Creek to the Pahsimeroi River in 2010 with the release of 95,023 USAL smolts (ad-intact and 100% CWT) into the Pahsimeroi River below the weir. The eventual goal is to shift the broodstock collection facility to the Yankee Fork Salmon River in the near future. Field operations related to development of the USAL program continue at the Pahsimeroi Fish Hatchery with the release of 93,700 DWOR stock smolts and 92,743 USAL stock smolts tagged with CWT at the Pahsimeroi weir in 2015 (Table 3).

Adult steelhead caught and sorted at the trap are checked for adipose fin clips and scanned for coded wire tags (CWT). Any ad-intact fish with CWT are considered a returning USAL-B stock fish and retained in the brood holding pond for use as USAL-B broodstock. Pahsimeroi Hatchery personnel installed the weir and opened the fish trap on February 13, 2015. The first USAL-B fish caught were two fish on February 17, the next were caught on March 11. A total of 430 fish identified as adult USAL stock steelhead were collected at the trap in 2015. All adult steelhead used for broodstock had a tissue sample taken for genetic analysis when they were spawned. Subsequent analysis of PBT samples indicate that 20 of the adult fish were non-program steelhead that were either misidentified as USAL stock fish or unmarked strays with CWT, resulting in the adjusted return of 410 adult USAL steelhead (Table 19). All of the returning females and 72% of the males were two-ocean fish. A total of 206 females were crossed with 161 males, producing approximately 1,212,826 green eggs for an average fecundity of 5,888 eggs per female. Survival to the eyed stage was 89.9%, resulting in the shipment of approximately 580,000 eyed eggs to Magic Valley to be reared to full-term smolts for stocking into the upper Salmon River basin or into the Little Salmon River in the spring of 2016. The remainder (approx. 500,000 eyed eggs) were transferred to the Shoshone-Bannock Tribe for their streamside incubation program in the Yankee Fork Salmon River. An additional 192,689 DWOR stock eyed eggs were received at Magic Valley from Clearwater Fish Hatchery to supplement the USAL smolt release program. Current plans are to release 93,000 DWOR stock and 153,000 USAL ad-intact smolts with CWT as future broodstock at Pahsimeroi weir.

To maintain genetic diversity of the program, the Eagle Genetics Lab processed PBT samples from broodstock in-season and provided relatedness coefficients for offspring before USAL eggs eyed up and were shipped to Magic Valley. This information was used to identify the most unrelated crosses for future broodstock to be released as ad-intact smolts with CWT at Pahsimeroi weir. The more related crosses will be released primarily as ad-clipped smolts in the Little Salmon River.

South Fork Clearwater River Program

In 2010, IDFG initiated a program to develop a hatchery broodstock that was locally adapted to the South Fork Clearwater River. Although hatchery fish have been released for years at Red River and Crooked River satellite facilities, very few hatchery adult steelhead returned to these sites; likely the result of fallout due to a partial migration barrier near Golden, Idaho. Since there are no adult collection facilities in the South Fork Clearwater River downstream of the partial

barrier, a volunteer angler contribution program has been used to collect broodstock that are collected directly from the South Fork Clearwater River. The goal of this program is to acquire broodstock that will provide all 843,000 of the progeny that are to be released by Clearwater into the South Fork Clearwater river drainage. Prior to brood year 2015, this program was supplemented with broodstock caught at the Dworshak trap facility. Adult steelhead contributing to the program are caught by anglers who provide them to hatchery personnel stationed on the South Fork Clearwater River with hatchery tank trucks for transporting them to Dworshak where they are held until spawning. In February and March of 2015 anglers caught and donated a total of 345 adult steelhead of hatchery-origin to the broodstock program (Table 19). These efforts resulted in the collection of 1,354,154 green eggs from spawning 175 females crossed with 135 males for an average fecundity of 7,738 eggs per female. This is the first year of the program that Clearwater's total production and release goal will be met with SFCR locally derived broodstock. This will include 501,000 smolts for the Meadow Creek release site, 219,000 smolts for the Red House Hole release site, and 123,000 smolts for the Newsome Creek release site.

RESEARCH

Estimating a Correction Factor for PIT Tag Expansions in Steelhead Returning to Sawtooth Fish Hatchery Trap

Research has shown that PIT-tagged adult Chinook Salmon return at lower rates than non-PIT-tagged fish due to tag loss and/or differential survival (Knudsen et al. 2009). In an effort to estimate PIT tag retention rates and/or differential survival in summer steelhead, an evaluation was initiated at SFH that utilized a PIT tag detection array in the adult ladder at the hatchery trap. The array is comprised of a multiplexing unit that has two antennas on each of two drop structures within the ladder, which assures that a fish ascending each of the drop structures will be detected whether it enters through the orifice in the keyway or over the spillway boards. If the last PIT tag detection for a fish was at one of the two upper antennas, then the fish was assumed to have been successfully trapped and retained for processing. Corrected expansion rates are calculated for each cohort returning to SFH by identifying and assigning returning adults to specific release groups to get a total estimated return of fish from a group that are represented by run-at-large (RAL) PIT tags. Returning adults with PIT tags that were designated as fish to be returned back to the river (RTR) at each Columbia River hydrosystem collection facility were excluded from the RAL group and therefore represent only themselves with a numerical expansion value of one. In previous years, age composition of returning adults was based on CWTs and the use of the statistical computer program *R* (R Development Core Team 2010) with the R*mix* library package (Macdonald 2010). Since 2013, PBT has been used to assign every returning adult fish that was used for spawning to a specific cohort. This provides a much larger sample size of known age fish to use in the R*mix* library package as well as increasing the power to decompose the adult return into specific age groups and release group strategies in the event of straying. The total number of PIT tags detected with the array, adjusted for detection efficiency, was used to calculate the corrected expansion rate for each release group. Detection efficiency of the array was estimated by calculating the proportion of PIT tags that were detected by hand scanning with a PIT tag reader that were last detected at one of the two upper trap array antennas. For 2015 the SFH ladder array detection efficiency was 98%.

A total of 753 PBT samples taken from fish used as broodstock were included in the age and stock composition analysis of the run. There were a total of 3,849 adult steelhead that returned to the weir in 2015 (Table 19). Results of the R*mix* and PBT analysis indicate that 39.0% of the return were of SAW brood year 2011 stock origin smolts released at Sawtooth weir in 2012

and 58.2% were of SAW brood year 2012 stock origin smolts released at Sawtooth weir in 2013. There were 1.5% that genotyped but failed to assign to a specific release group, and 0.7% that failed to genotype. The remaining 0.6% assigned to smolts released at McNabb Point, Yankee Fork Salmon River, and Pahsimeroi Hatchery. Applying these proportions to the total return, there were 1,501 adult steelhead that returned to the weir in 2015 that were from the 2011 brood year smolt release group, and there were 2,239 that returned from the 2012 brood year smolt release group (Table 21). With the return of 12.2 RAL PIT tags from brood year 2011 and 35.5 RAL PIT tags from brood year 2012 (after corrections for detection efficiency), the adjusted expansion is 122.5 and 62.8 fish per tag, respectively. An increase in the expansion rate like that of the brood year 2011 return is not unexpected, assuming that some fish will shed tags after release, that there may be a higher mortality rate of tagged fish, or a combination of the two. The decrease in the expansion rate like that of the brood year 2012 return is not expected but may be explained with sampling error or selection bias. Since fish not used for broodstock are not measured, the age structure of the adult return is based on the proportionally expanded length distribution of measured fish to the unmeasured fish. If hatchery personnel are selecting larger fish to be used for broodstock (either intentionally or not), then the analysis of PBT samples will overestimate the actual return of brood year 2011 fish while underestimating the return of brood year 2012 fish. This would have the effect of increasing the expansion rate of the brood year 2011 fish and decreasing the expansion rate of the brood year 2012 fish. The high level of variation in adjusted expansion rates since this evaluation began makes it difficult to predict survival between tagged and untagged fish and in tag retention rates.

Table 21. PIT tag expansion rates, adult detections, and expanded adult return estimates for Brood Year 2012 (one-ocean) and 2011 (two-ocean) steelhead returning to Sawtooth Fish Hatchery in 2015. Detections have been corrected for PIT array efficiency. Actual return estimates were generated using PBT and trapping information.

Spawn Year (Recovery)		**BY2011**	**BY2012**
	Total Released	750,556	842,034
	# RAL PIT Tags	9,464	10,811
	# RTR PIT Tags	3,978	4,510
	RAL Expansion at Release	78.9	77.9
2014	Number of RAL PIT Tags Recovered[1]	18.5	
	Number of RTR PIT Tags Recovered[1]	4.0	
	Expanded Return (RAL only)	1,458	
	Actual Return (RAL only)	1,704	
	Corrected 2014 RAL Expansion	92.2	
2015	Number of RAL PIT Tags Recovered[2]	12.2	35.5
	Number of RTR PIT Tags Recovered[2]	6.1	8.1
	Expanded Return (RAL only)	963	2,765
	Actual Return (RAL only)	1,495	2,231
	Corrected 2015 RAL Expansion	122.5	62.8

[1] Corrected for a 76% array detection efficiency.
[2] Corrected for a 98% array detection efficiency.

Evaluation of Steelhead Reared in a Reuse Aquaculture System at Hagerman National Fish Hatchery

Hagerman National Fish Hatchery (Hagerman) is participating in a pilot study to evaluate the effectiveness of a partial reuse aquaculture system (PRAS) to rear steelhead. Hagerman elected to participate in the study because their source of water in the Hagerman Valley is limited and has been declining over the past several years. As a result, Hageman is facing the choice of either reducing production of steelhead or adopting methods, such as water reuse, that will allow maintaining current production targets with less flow. The PRAS system selected uses three circular rearing tanks and associated reuse infrastructure housed in a stand-alone building. The circular tank system was selected because of suggested benefits of ease of operation and improved fitness to the fish reared in a higher velocity environment, as well as the lower flow requirements of the system.

The PRAS building includes three rectangular tanks (not on reuse) to rear steelhead from incubation to marking (~100 fish/lb.) before transferring to the PRAS system. Each of the three PRAS tanks measures 30 ft. in diameter, 6 ft. deep, with 3,885 ft^3 of rearing volume, sufficient in size to allow loading up to approximately 30,000 fish per tank at 4.5 fish/lb. Each tank is equipped with a bottom center drain for effluent/waste removal and a side drain port for effluent and reuse water withdraw. Reuse flow is passed through a common drum filter, sump pumps, degas/reaeration tower and returned to circular tanks. Inflow jets create circular flow to produce velocities of 0.5 - 2.0 fps.

Evaluation of the system in 2014 and 2015 include a paired treatment test comparing steelhead reared in the PRAS to those reared in the conventional raceways at the same loading densities as the PRAS tanks (0.20 density index, 1.5 flow index). Future evaluations (brood year 2016) will include a second control group of steelhead reared in the raceways at loading densities typical for the rest of the hatchery (0.23 density index, 1.5 flow index). Variables between treatment and control groups are being reduced by using only SAW stock fish released at Sawtooth weir in the evaluation. For the first two years of study, the system was operated on 50% reuse water. Primary variables of interest are associated with survival and condition (fitness) of steelhead in the two systems. Evaluation metrics for juvenile fish variables include the health assessment index (HAI) to provide a health profile based on the percentages of anomalies observed in the tissues and organs of individuals sampled from a population (Goede et al. 1990). Fin erosion, internal fat levels, and visual analysis of body conformation are also being evaluated. Evaluation metrics after release include smolt survival through the Snake and Columbia river hydropower system and adult returns to the weir. Comparisons of adult returns will be based on the recovery of CWTs used to differentiate between fish reared in the PRAS and those reared in the raceways. Spawn year 2017 will be the first year that fish reared in the PRAS will be returning to the weir as age 3 (1-ocean) adults. Sawtooth Fish Hatchery personnel will be scanning all adult steelhead that return to the weir for CWT that year and in consecutive years until the evaluation is complete.

Several unexpected issues came up during the first year the PRAS system was put into use in 2014. These include operational issues with the new equipment, causing water quality problems in the rearing tanks. Despite these issues, prerelease examinations did not show large variations in evaluation metrics between the study groups except for internal fat levels (Corie Samson, USFWS, personal communication). Fish held in the conventional raceways had greater than 50% coverage of fat on their pyloric caeca but very few had 100% fat coverage. The majority of fish examined in the PRAS group had 100% fat coverage of the pyloric caeca. After release in 2015, adjusted survival rates of fish reared in the PRAS was 41.1% while the adjusted survival

rate of fish reared in the raceways was 94.1% (Table 22). Since the fish reared in the PRAS appeared to be as healthy as those reared in the raceways at release, the low survival rate to LGD may actually be a result of a higher rate of tag loss (shedding) prior to release or a higher rate of residualism. With the involvement of personnel from Abernathy Fish Technology Center (FWS), further evaluation is being considered for a more comprehensive comparison of PIT tag retention rates in future release groups. Results of the adult return of this first cohort reared in the PRAS will not be available until the adult return and recovery of treatment and control group CWTs from the 2017 spawn year.

Table 22. Metrics used to estimate adjusted survival from release to LGD of brood year 2014 steelhead reared in the PRAS tanks, the control raceways, and the raceways not included in the study.

Release Group	Number Released	Rearing Density	PIT Tags Released	Number of Unique Detections at LGD	Probability of Detection at LGD	Adjusted % Survival (95% CI)
Sawtooth Weir	1,342,274	0.23	25,977	1,235	0.065	73.1 (66.2-80.0)
Sawtooth Weir PRAS	92,304	0.20	8,670	277	0.078	41.1 (31.6-50.6)
Sawtooth Weir Control	91,301	0.20	8,753	535	0.065	94.1 (81.0-107.2)

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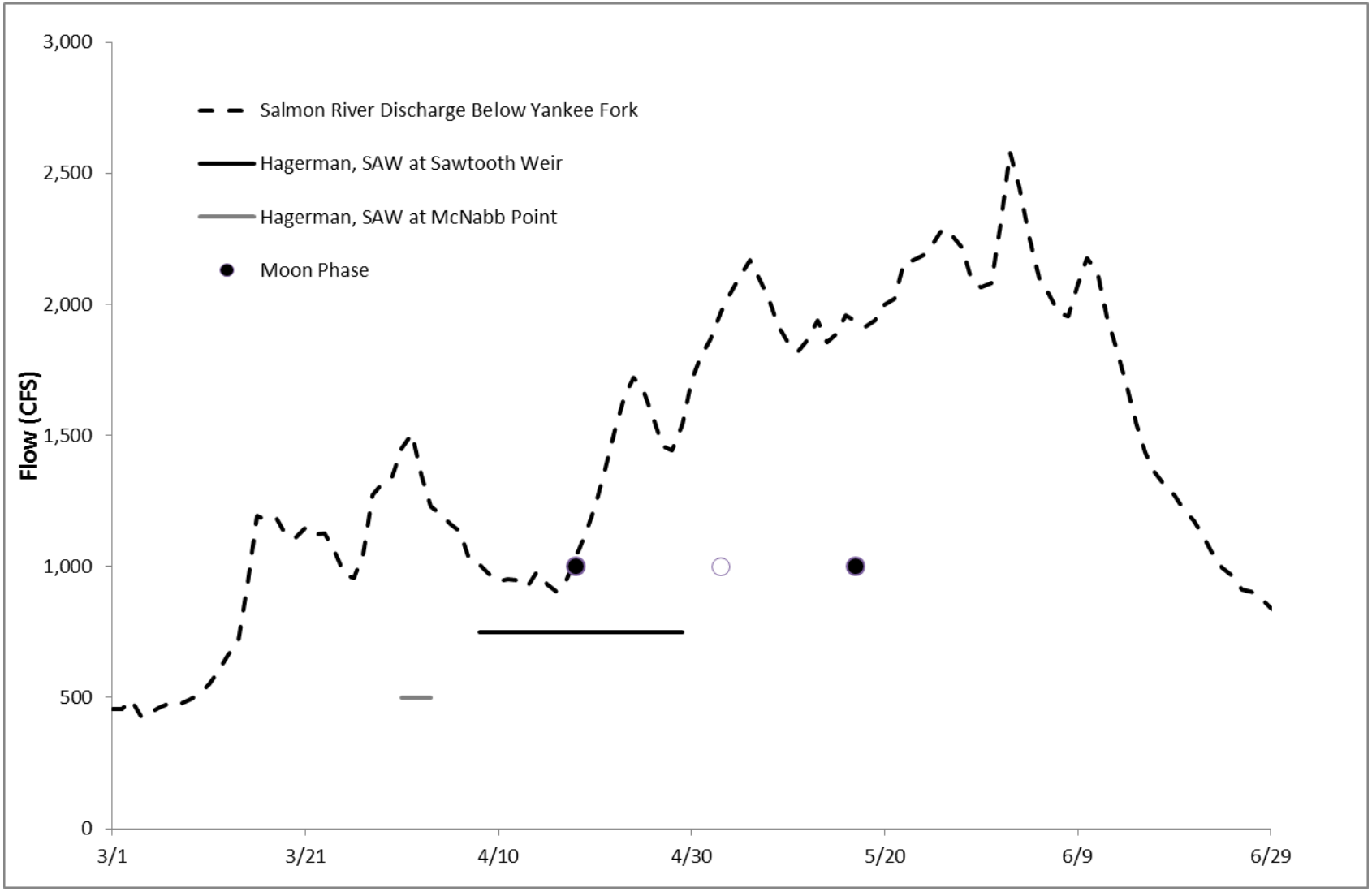
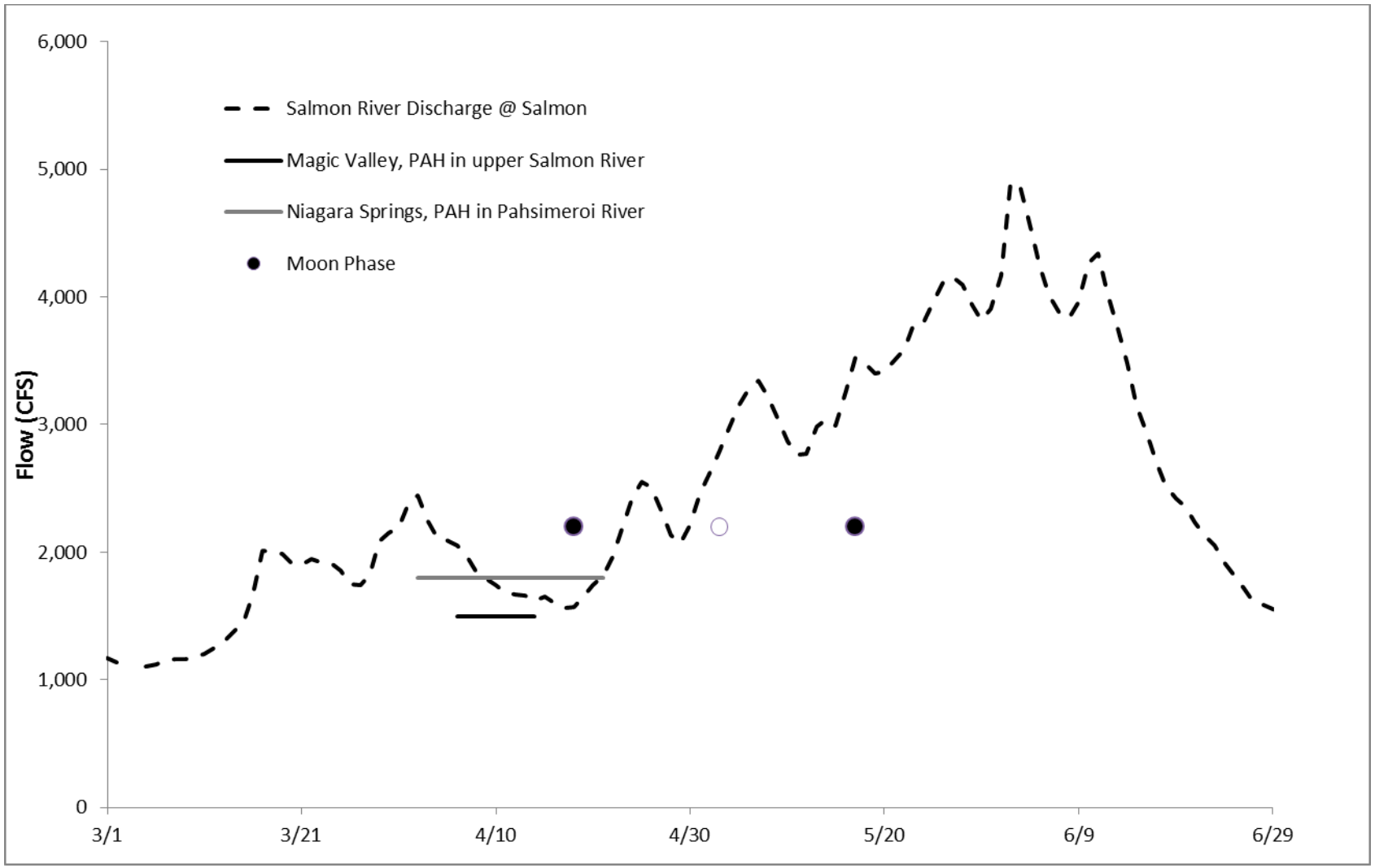
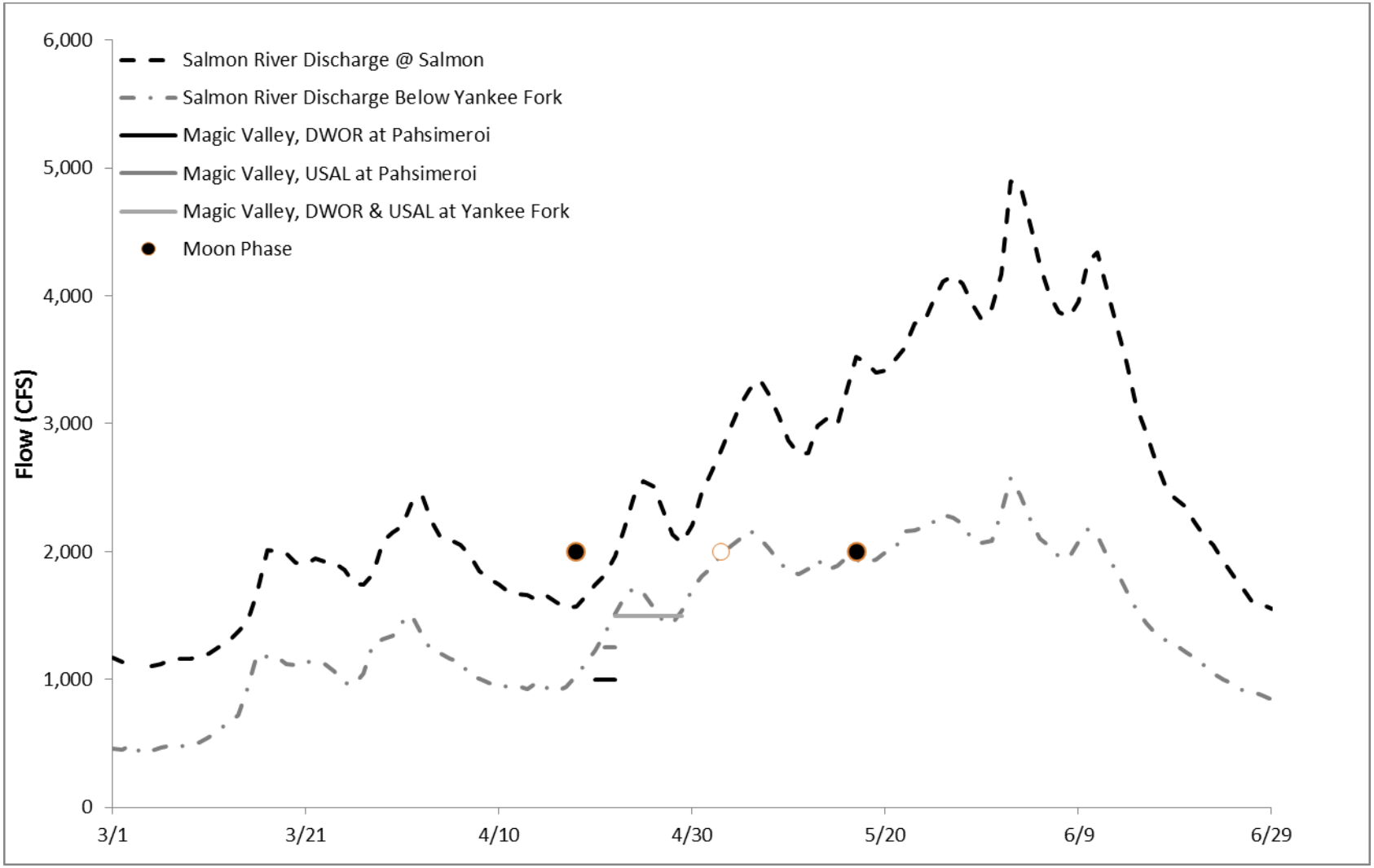
APPENDICES



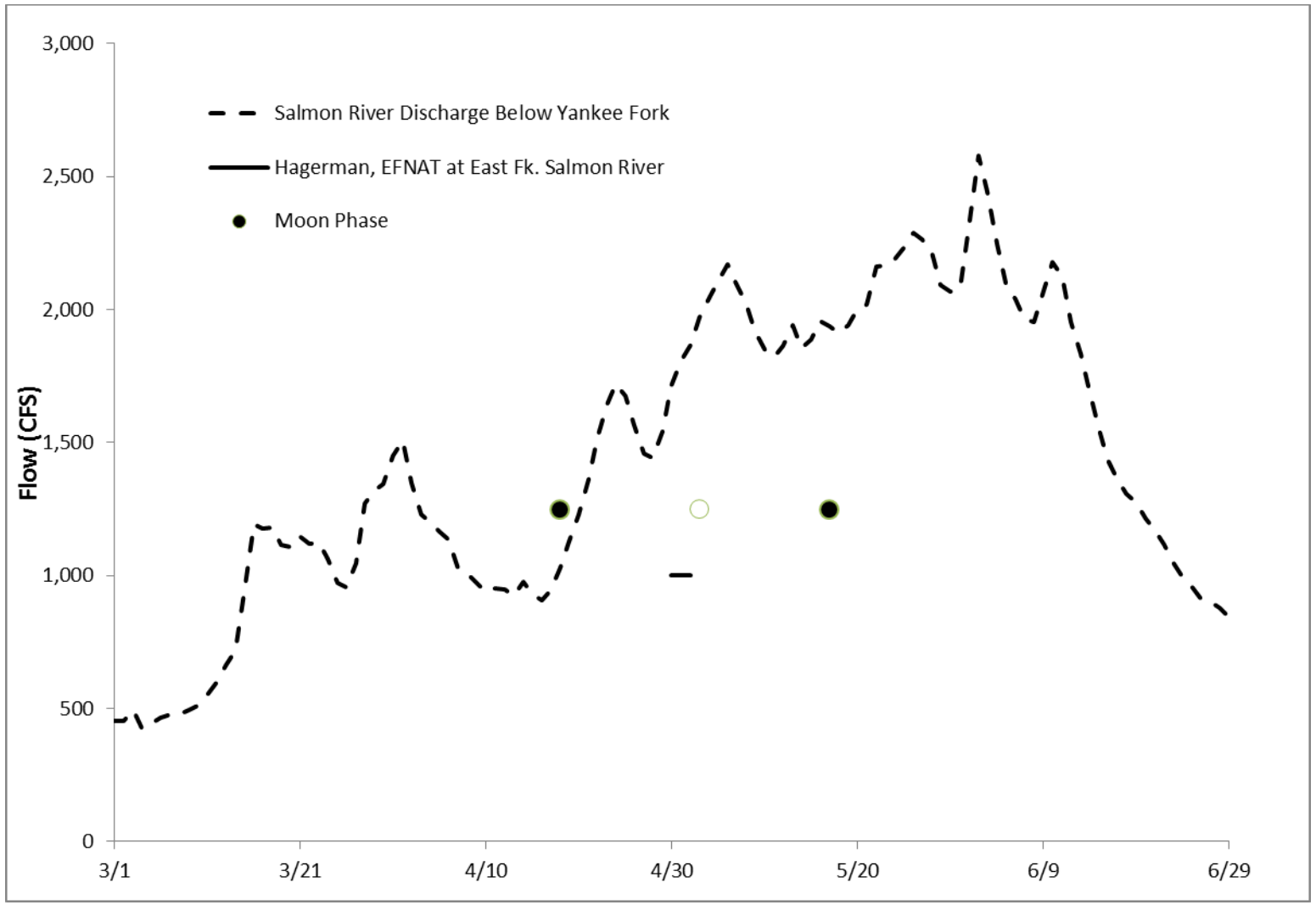
Appendix A1. Release timing of SAW stock smolts from Hagerman into the Salmon River at Sawtooth weir and McNabb Point vs moon phase and Salmon River flows below Yankee Fork in 2015.



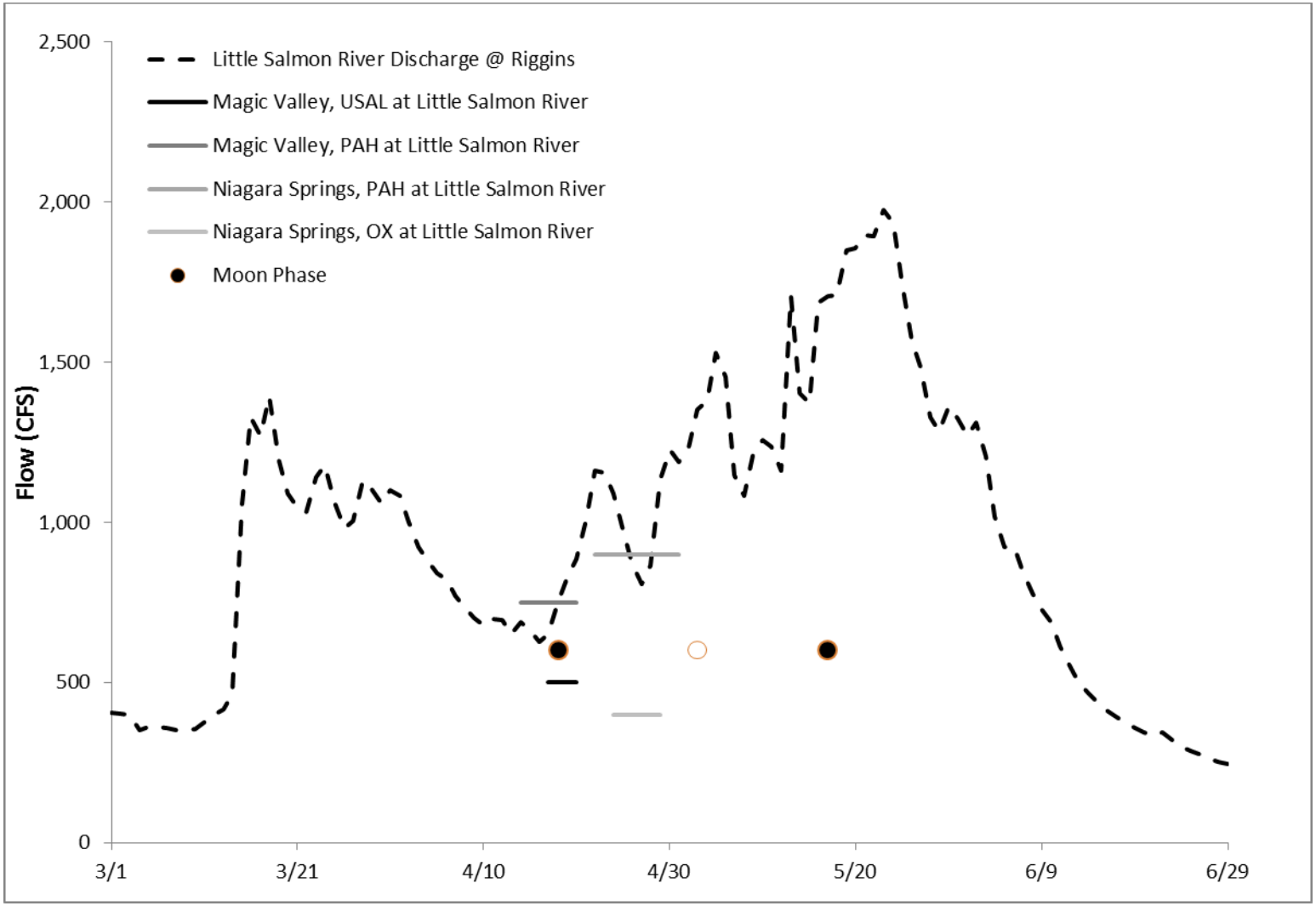
Appendix A2. Release timing of PAH stock smolts from Magic Valley and Niagara Springs into the Salmon River and Pahsimeroi River vs moon phase and Salmon River flows at Salmon City in 2015.



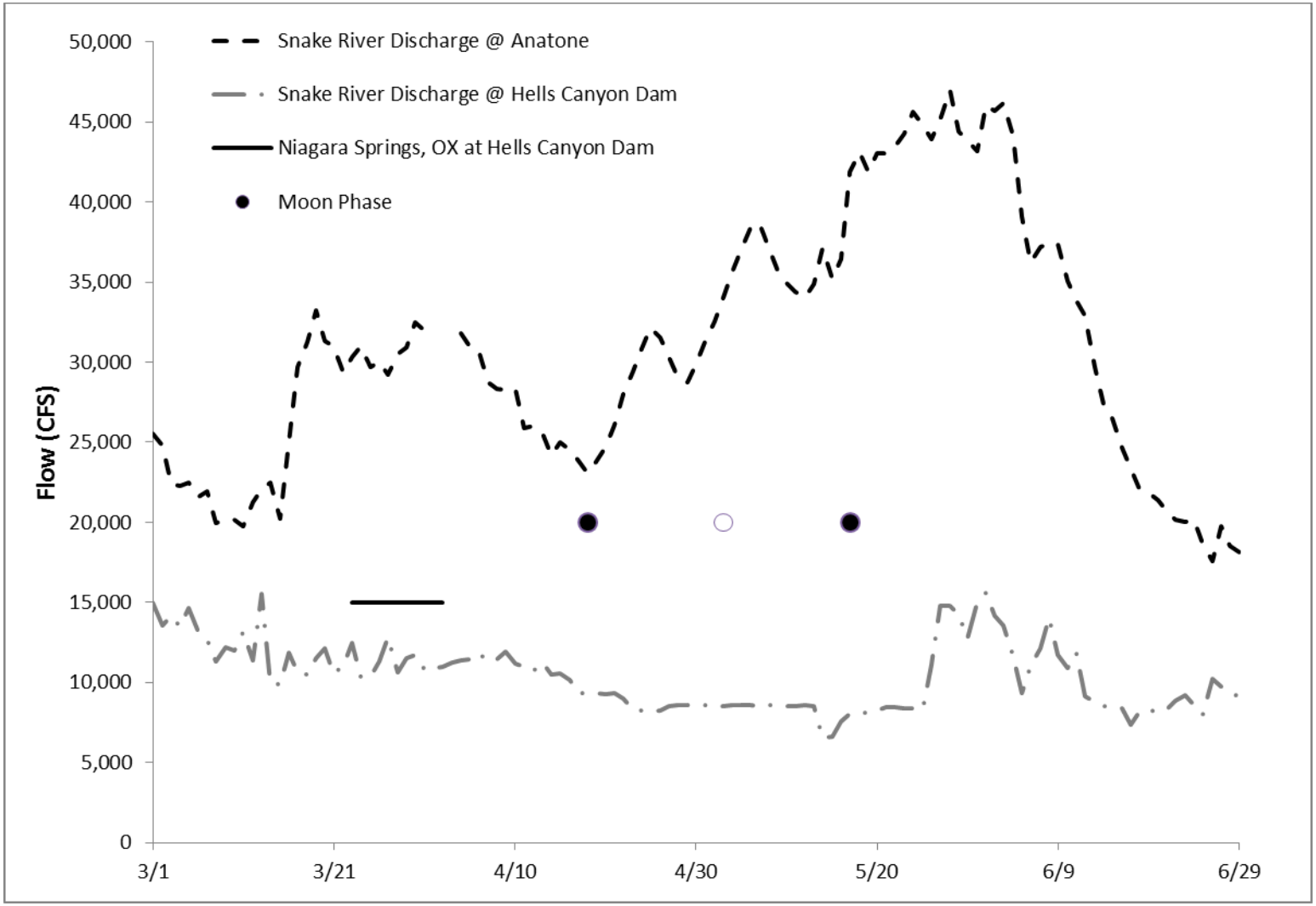
Appendix A3. Release timing of DWOR and USAL stock smolts from Magic Valley into the Salmon River, Yankee Fk., and Pahsimeroi River vs moon phase, Salmon River flows below Yankee Fk., and Salmon River flows at Salmon City in 2015.



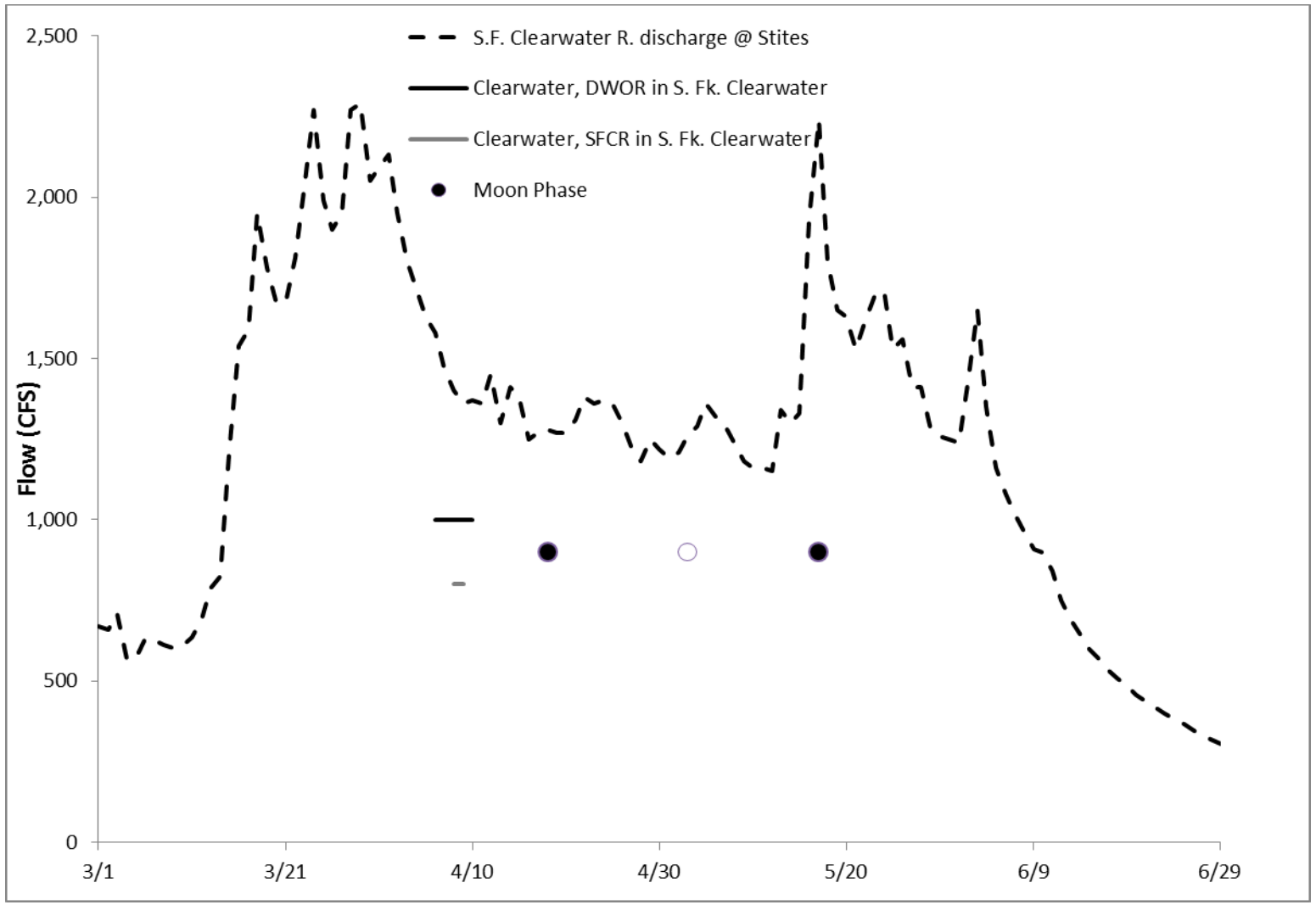
Appendix A4. Release timing of EFNAT stock smolts from Hagerman into the East Fork Salmon River vs moon phase and Salmon River flows below Yankee Fork in 2015.



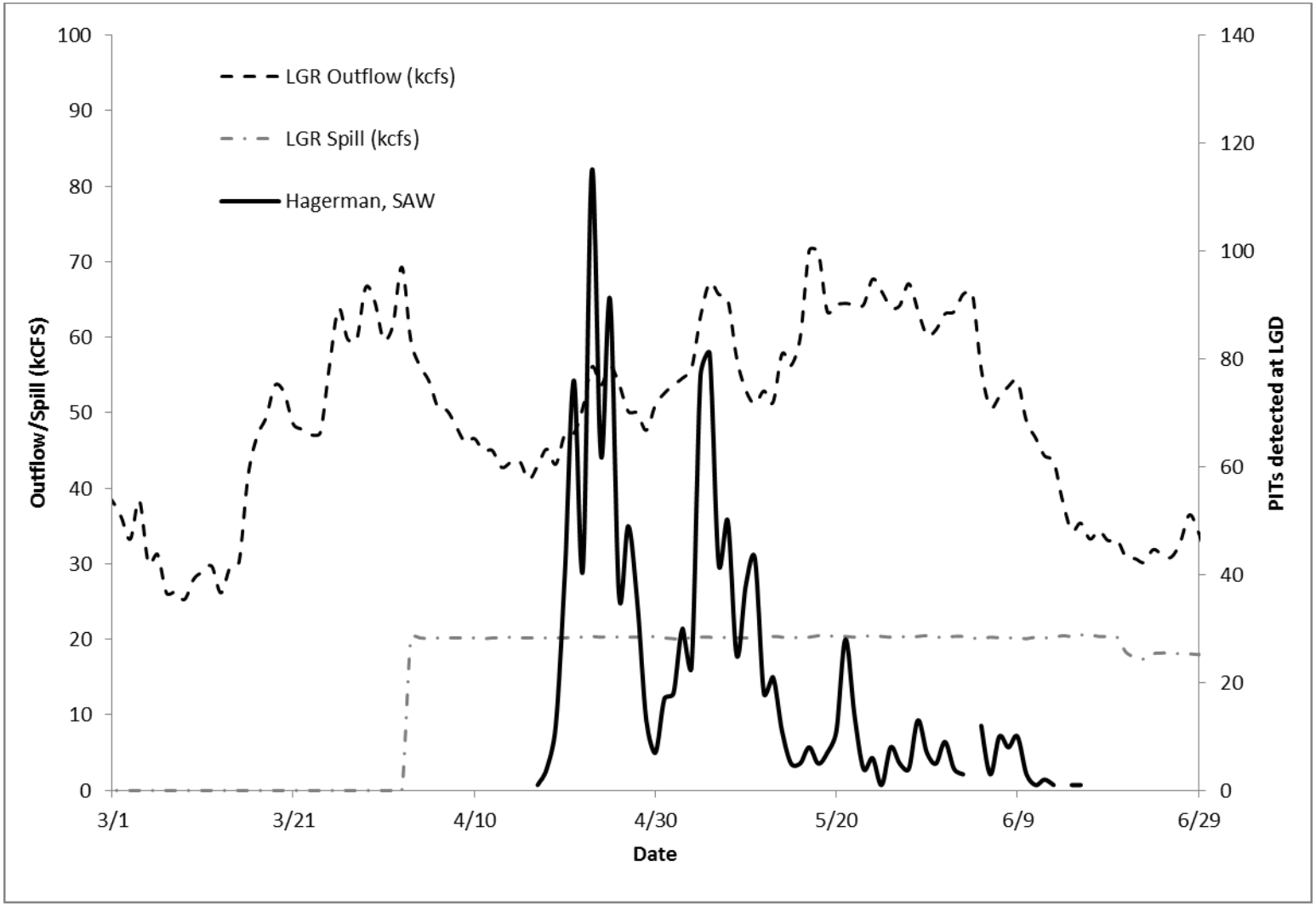
Appendix A5. Release timing of USAL, OX and PAH stock smolts from Magic Valley and Niagara Springs vs moon phase and Little Salmon River flows in 2015.



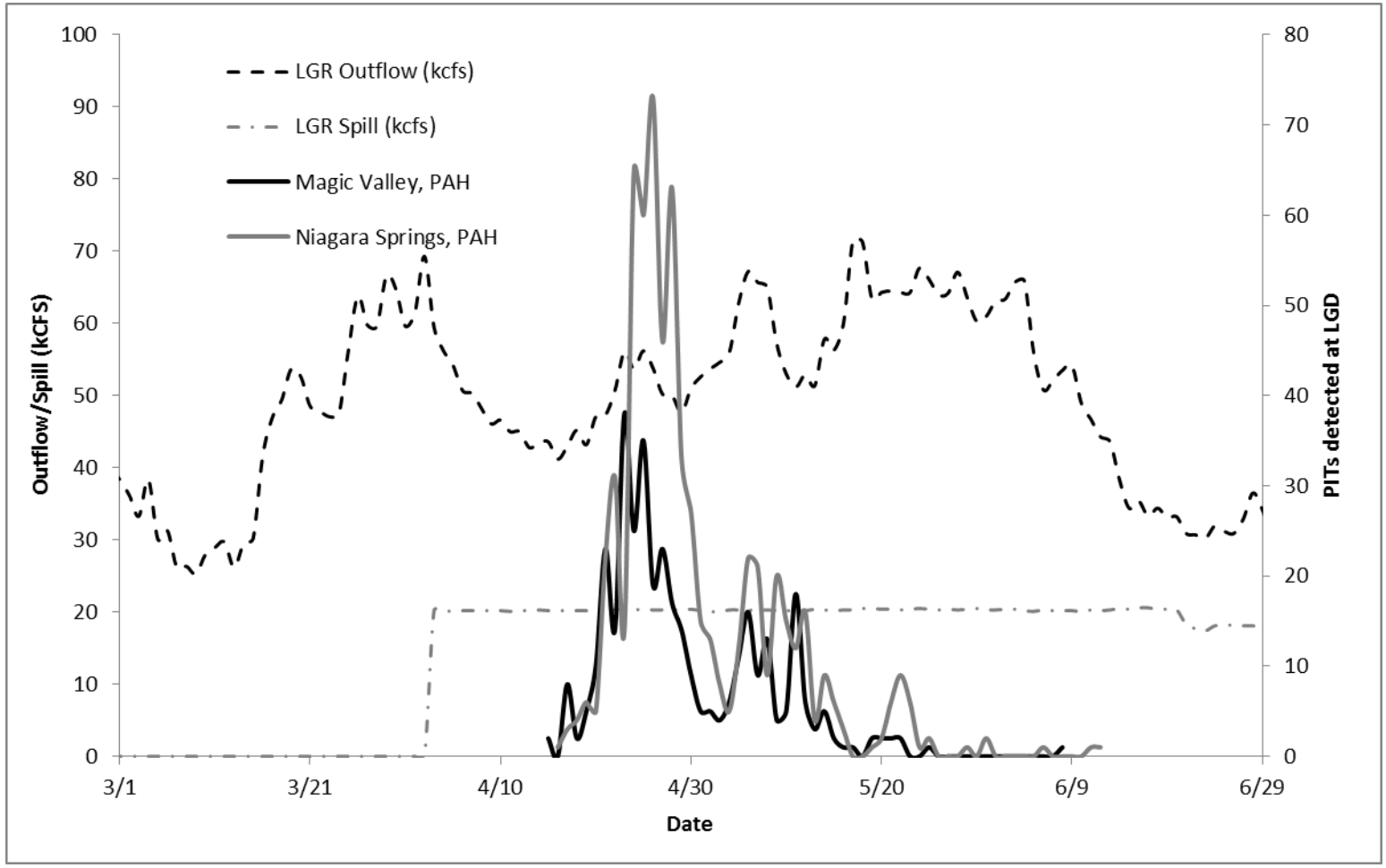
Appendix A6. Release timing of OX stock smolts from Niagara Springs into the Snake River below Hells Canyon Dam vs moon phase and Snake River flows at Hells Canyon Dam and at Anatone in 2015.



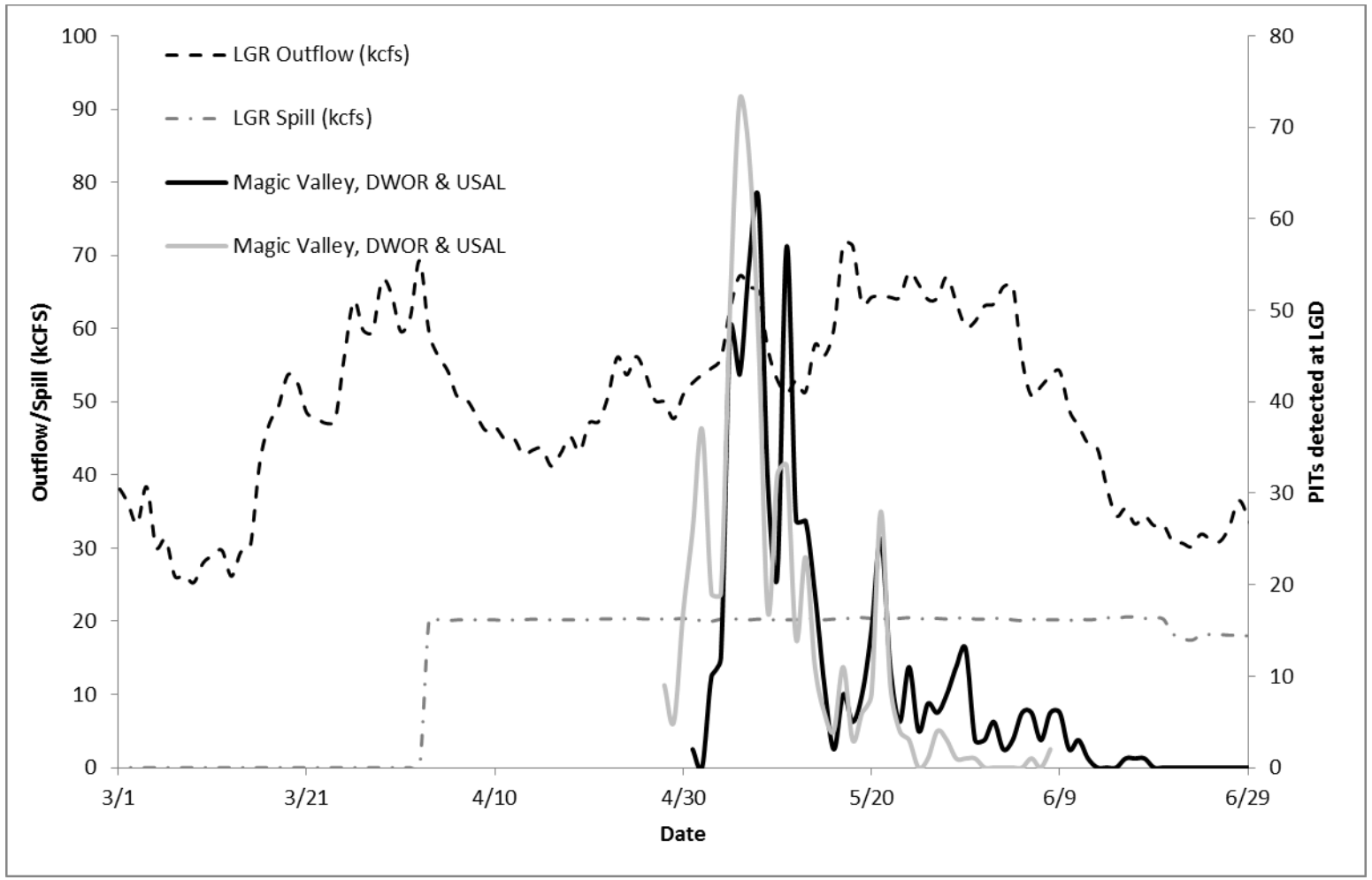
Appendix A7. Release timing of DWOR and SFCR stock smolts from Clearwater into the South Fork Clearwater River vs moon phase and South Fork Clearwater River flows in 2015.



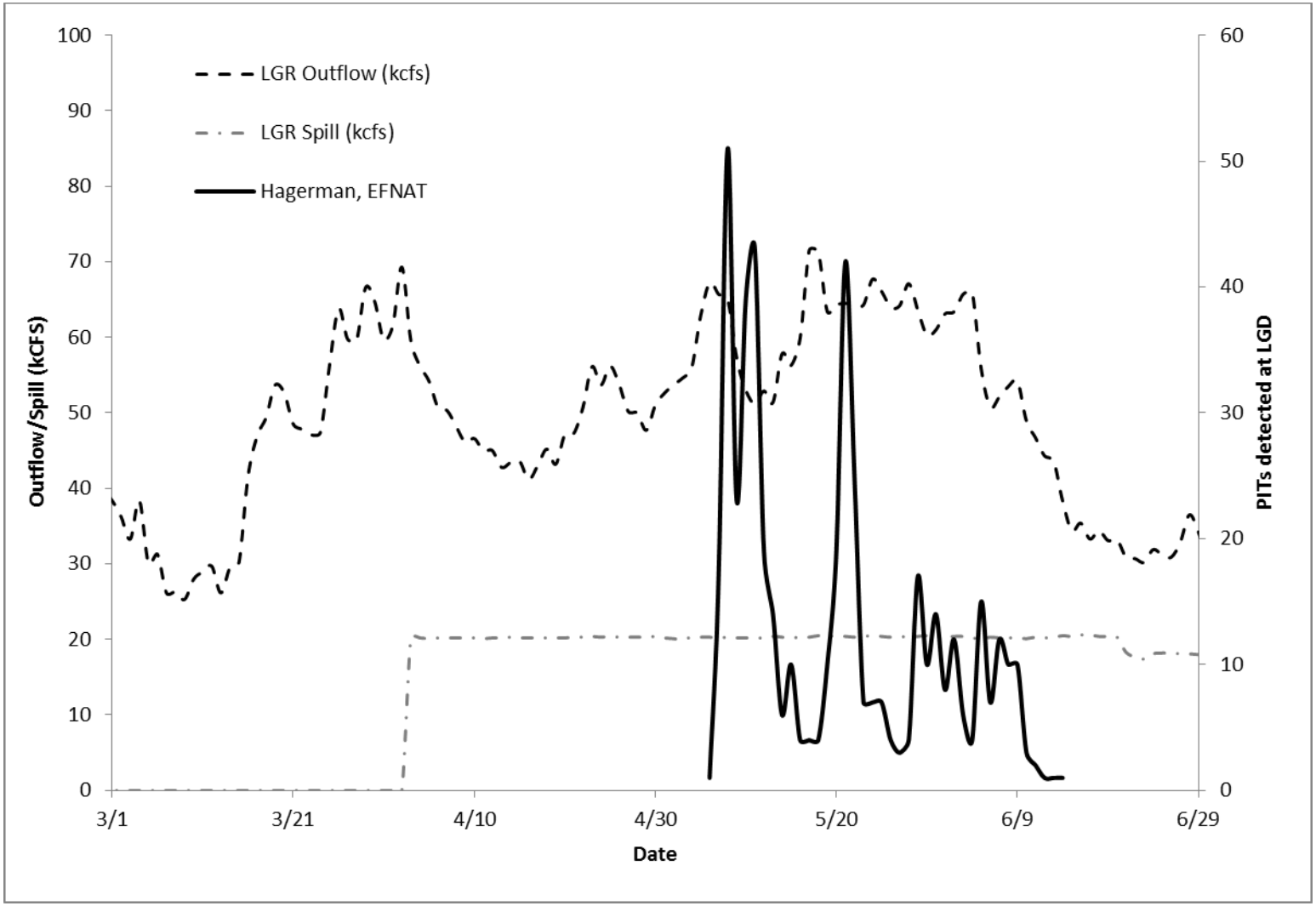
Appendix B1. Smolt arrival timing at LGD of SAW stock smolts from Hagerman released into the upper Salmon River vs. dam outflow and spill in 2015.



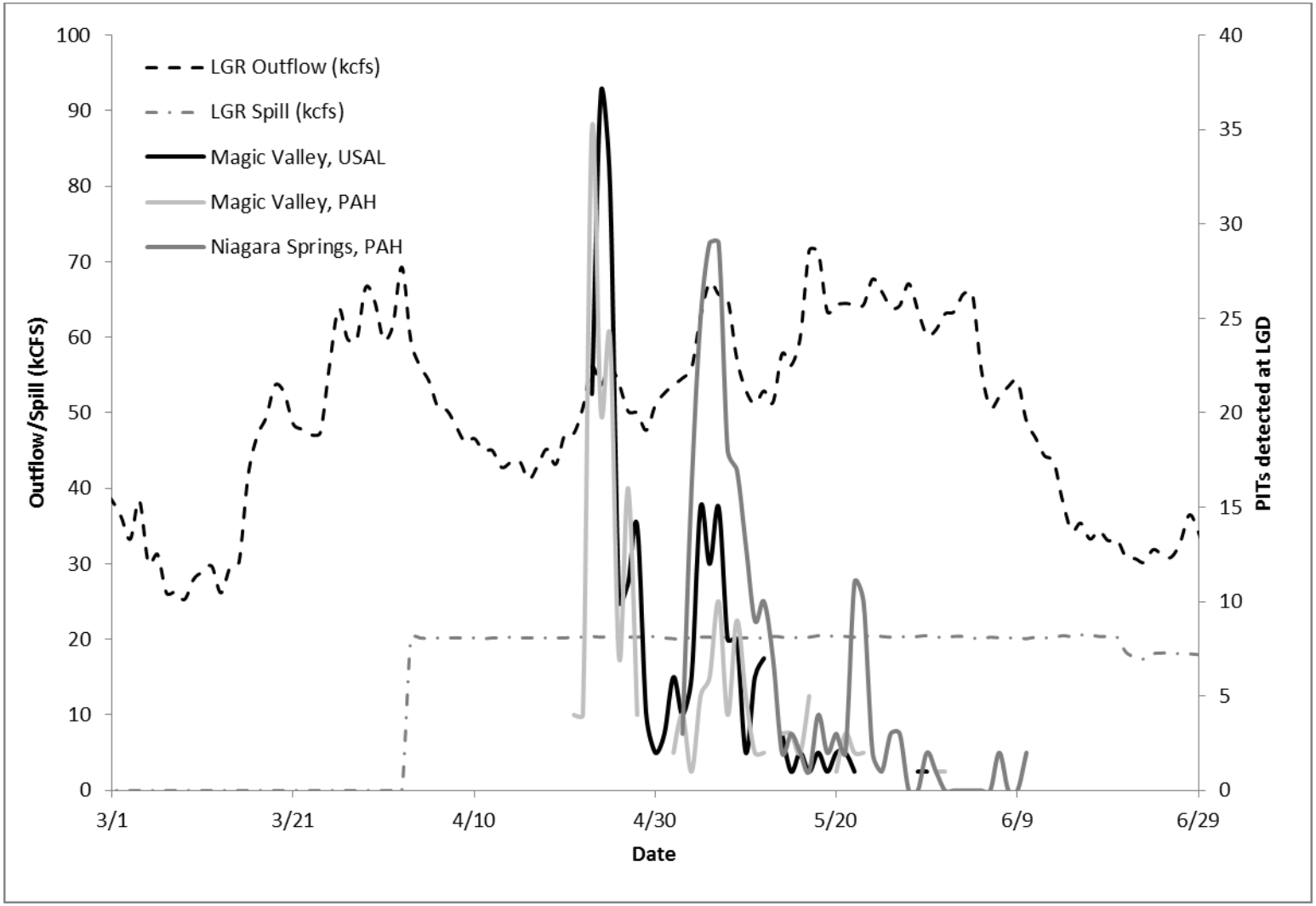
Appendix B2. Smolt arrival timing at LGD of PAH stock smolts from Magic Valley and Niagara Springs released into the upper Salmon River and Pahsimeroi River vs. dam outflow and spill in 2015.



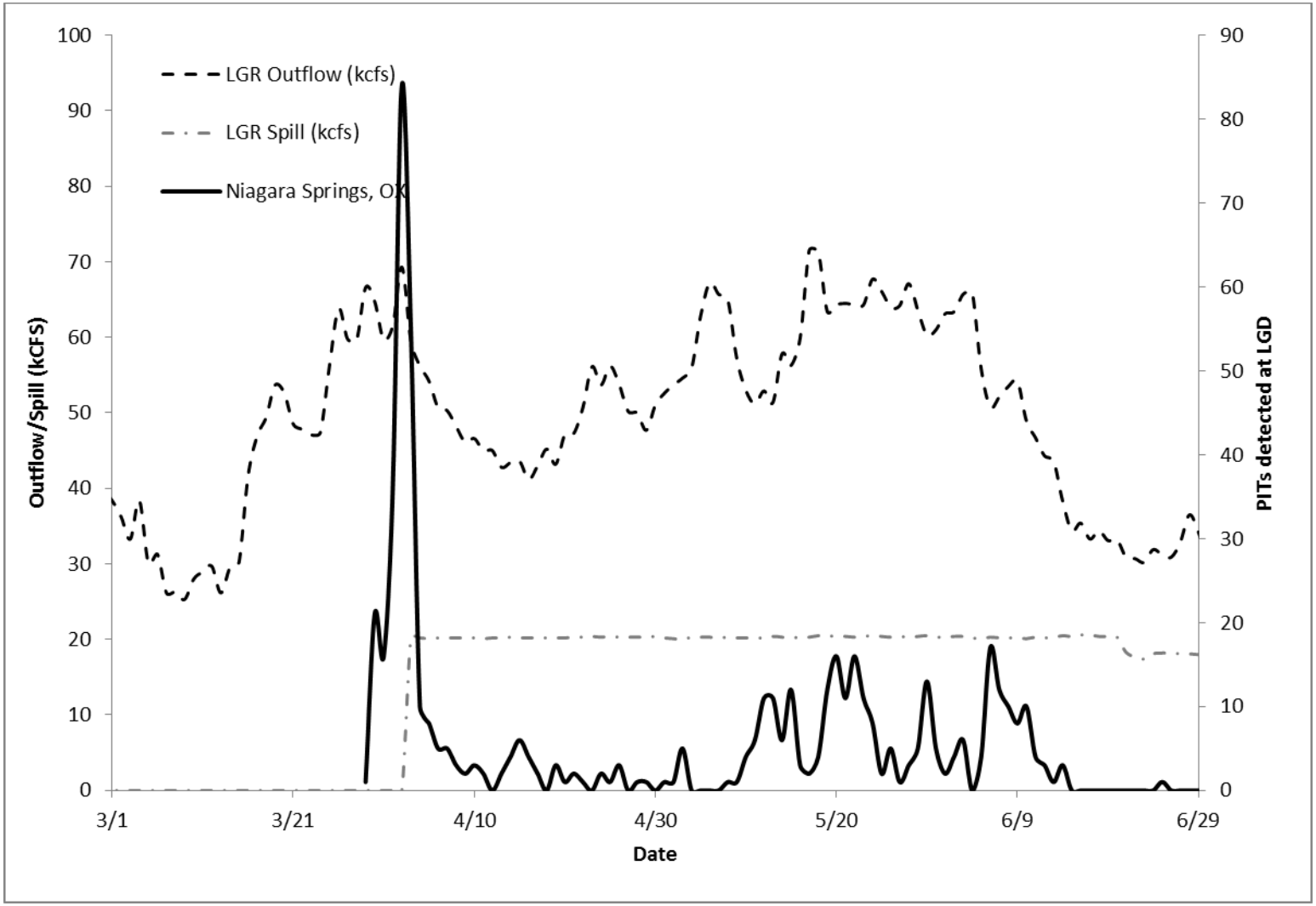
Appendix B3. Smolt arrival timing at LGD of DWOR and USAL stock smolts from Magic Valley released into the Yankee Fork and Pahsimeroi river vs. dam outflow and spill in 2015.



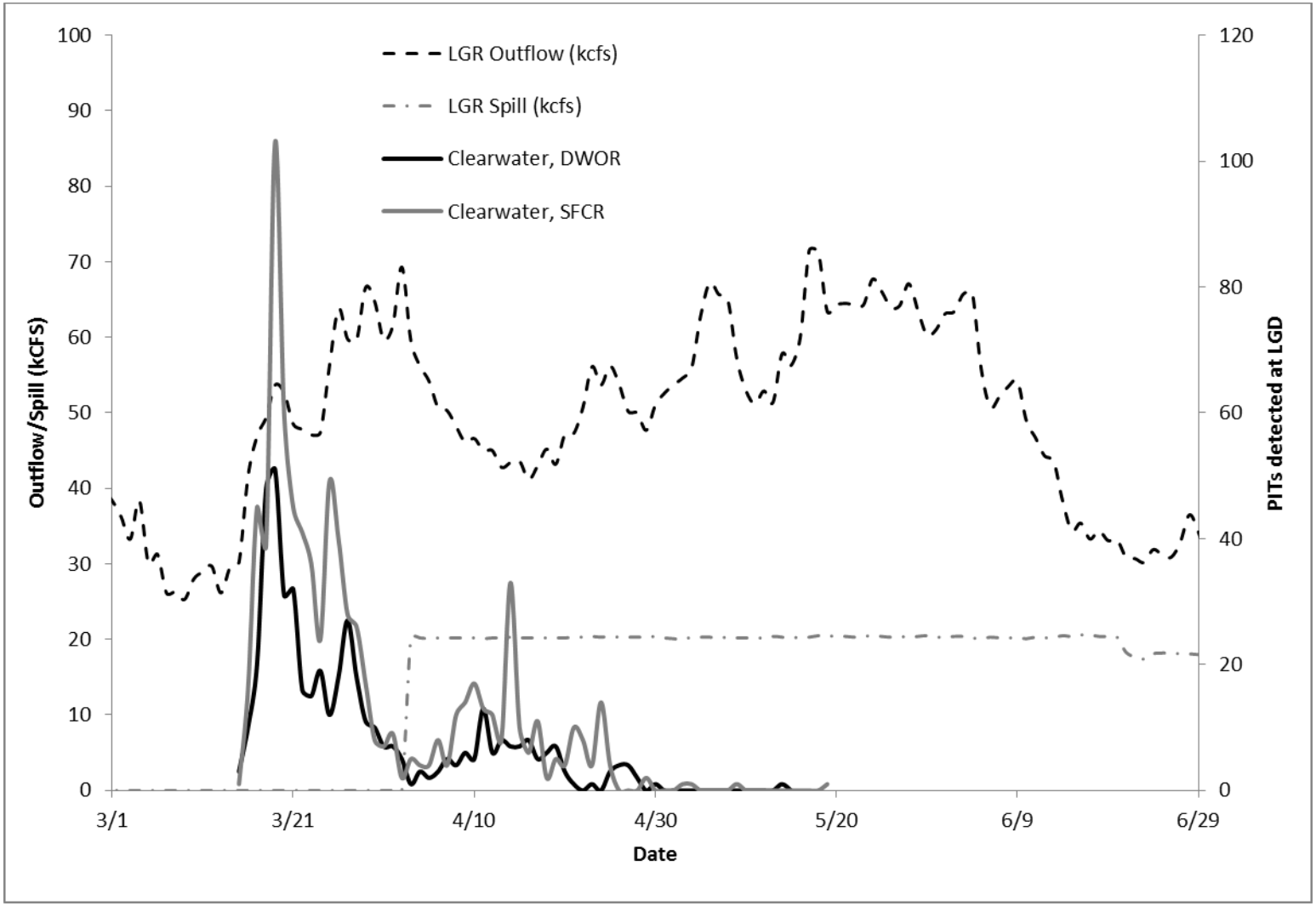
Appendix B4. Smolt arrival timing at LGD of EFNAT stock smolts from Hagerman released into the East Fork Salmon River vs. dam outflow and spill in 2015.



Appendix B5. Smolt arrival timing at LGD of PAH and USAL stock smolts from Magic Valley and Niagara Springs released into the Little Salmon River vs. dam outflow and spill.



Appendix B6. Smolt arrival timing at LGD of OX stock smolts from Niagara Springs released into the Snake River below Hells Canyon Dam vs. dam outflow and spill.



Appendix B7. Smolt arrival timing at LGD of DWOR and SFCR stock smolts from Clearwater released into the South Fork Clearwater River vs. dam outflow and spill.

Appendix C1. Total number of coded wire tags recovered to estimate the stock composition of the adult steelhead harvest from the fall of 2014 Idaho recreational fishery (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, UFH=Oregon's Umatilla Fish Hatchery, CWFH=Washington's Cottonwood Fish Hatchery, LFFH=Washington's Lyon's Ferry Fish Hatchery, TUFH=Washington's Tucannon Fish Hatchery).

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2010-CLFH-DWOR-S. Fk. Clearwater R.			1					
2011-CLFH-DWOR-S. Fk. Clearwater R.	3		53		1			
2012-CLFH-DWOR-S. Fk. Clearwater R.			1					
2012-CLFH-SFCR-S. Fk. Clearwater R.	2		4					
2011-DNFH-DWOR-N. Fk. Clearwater R.	4		35	2				
2011-DNFH-DWOR-S. Fk. Clearwater R.	1		15					
2012-DNFH-DWOR-N. Fk. Clearwater R.			6					
2012-DNFH-DWOR-S. Fk. Clearwater R.			3					
2011-HNFH-SAW-Upper Salmon R.	3						7	
2011-HNFH-SAW-Yankee Fork R.							3	
2012-HNFH-SAW-Upper Salmon R.	12	1				3	13	
2012-HNFH-SAW-Upper Salmon R.	13	1	1				18	
2012-HNFH-SAW-Yankee Fork R.	1	1					12	
2012-HNFH-EFNAT-E. Fk. Salmon R.	1							
2011-IFH-IMNA-Imnaha R. OR	11	5	3			1		
2012-IFH-IMNA-Imnaha R. OR	22	5				5		
2011-IFH-WALL-Grande Ronde R. OR	60	2	5			1		
2012-IFH-WALL-Grande Ronde R. OR	56	1	2					
2011-LFFH-LYON-Lyons Ferry WA	3		2					
2012-LFFH-LYON-Lyons Ferry WA	14		2					
2011-MVFH-USAL-E. Fk. Salmon R.	5					4	2	
2011-MVFH-USAL-Little Salmon R.	22	1	1			7		
2011-MVFH-USAL-Pahsimeroi R.						1		

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2011-MVFH-USAL-Upper Salmon R.	1		1			2	4	
2012-MVFH-USAL-Little Salmon R.	1					1	1	
2012-MVFH-USAL-Upper Salmon R.							1	
2010-MVFH-PAH-Upper Salmon R. below E. Fk.						1		
2011-MVFH-PAH-Little Salmon R.	3					21	2	1
2011-MVFH-PAH-Upper Salmon R. below E. Fk.	9		2			5	11	
2012-MVFH-PAH-Little Salmon R.	18	1				24	1	
2012-MVFH-PAH-Upper Salmon R. below E. Fk.	23	1				5	27	
2011-MVFH-SAW-Upper Salmon R.	3						13	
2010-NSFH-OX-Hells Canyon		1						
2011-NSFH-OX-Hells Canyon	14	10	1			1		
2011-NSFH-OX-Little Salmon R.	5	1				11	4	
2012-NSFH-OX-Hells Canyon	4	5						
2011-NSFH-PAH-Little Salmon R.	3					7	2	
2011-NSFH-PAH-Pahsimeroi R.	2		1				5	
2012-NSFH-PAH-Hells Canyon	11	6				3		
2012-NSFH-PAH-Little Salmon R.	27	1				21	3	1
2012-NSFH-PAH-Pahsimeroi R.	13					3	6	
2011-UFH-UMA-Umatilla R Below Snake OR	1		1					
2011-CWFH-WALL-Grande Ronde R. WA	11							
2012-CWFH-WALL-Grande Ronde R. WA	16		1					
2011-TUFH-LYON-Touchet R Below Snake WA			2					
2011-TUFH-TUC-Tucannon R-Snake R WA			1					
2012-TUFH-LYON-Touchet R Below Snake WA	2		2					
Total	**400**	**43**	**146**	**2**	**1**	**127**	**135**	**2**

Appendix C2. Number of coded wire tags recovered to estimate the stock composition of the adult steelhead harvest from the spring 2015 Idaho recreational fishery (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, CWFH=Washington's Cottonwood Fish Hatchery, TUFH=Washington's Tucannon Fish Hatchery).

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19	Little Salmon Sect. 20
2011-CLFH-DWOR-S. Fk. Clearwater R.			44	1	8				
2011-CLFH-SFCR-S. Fk. Clearwater R.			1		1				
2012-CLFH-SFCR-S. Fk. Clearwater R.					1	1			
2011-DNFH-DWOR-N. Fk. Clearwater R.			74	19					
2011-DNFH-DWOR-S. Fk. Clearwater R.			12	1	3				
2012-DNFH-DWOR-N. Fk. Clearwater R.			3	3					
2012-DNFH-DWOR-S. Fk. Clearwater R.			1						
2010-HNFH-SAW-Yankee Fork R.								1	
2011-HNFH-SAW-Upper Salmon R.						1	1	4	
2011-HNFH-SAW-Yankee Fork R.								2	
2012-HNFH-SAW-Upper Salmon R.						1	10	19	
2012-HNFH-SAW-Upper Salmon R.		1					5	2	
2012-HNFH-SAW-Yankee Fork R.							4	10	
2011-IFH-IMNA-Imnaha R. OR	1	1							
2012-IFH-IMNA-Imnaha R. OR	1	5				1			
2011-MVFH-DWOR-E. Fk. Salmon R.						2	3		
2011-MVFH-DWOR-Little Salmon R.	1	4				8	1		8
2011-MVFH-DWOR-Upper Salmon R.		1				2	3		
2012-MVFH-DWOR-Little Salmon R.						1			1
2011-MVFH-PAH-Little Salmon R.						3			9
2011-MVFH-PAH- Salmon R. below Pahsimeroi R.						3	17		
2012-MVFH-PAH-Little Salmon R.	1					10	1		7
2012-MVFH-PAH- Salmon R. below Pahsimeroi R.						2	28		

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19	Little Salmon Sect. 20
2011-MVFH-SAW-Upper Salmon R.						2	3	2	
2011-MVFH-USAL-Upper Salmon R.						1			
2011-NSFH-OX-Hells Canyon	1	4							
2011-NSFH-OX-Little Salmon						1			3
2012-NSFH-OX-Hells Canyon		1							
2011-NSFH-PAH-Little Salmon R.									5
2011-NSFH-PAH-Pahsimeroi	1					1	2		
2012-NSFH-PAH-Hells Canyon	1	7							
2012-NSFH-PAH-Little Salmon R.	2					17	1		15
2012-NSFH-PAH-Pahsimeroi R.	1						9		
2012-CWFH-WALL-Grande Ronde R. WA	1								
2011-TUFH-TUC-Tucannon R-Snake R WA				1					
Total	**11**	**24**	**135**	**25**	**13**	**57**	**88**	**40**	**48**

Appendix C3. Number of tissue samples analyzed using PBT to estimate the stock composition of the adult steelhead harvest from the fall 2014 recreational fishery. No PBT samples were collected in Section 18-19 on the Upper Salmon River during the fall sampling period (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, LFFH=Washington's Lyon's Ferry Fish Hatchery).

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2011-CLFH-DWOR-S. Fk. Clearwater R.			23	3	1			
2012-CLFH-DWOR-S. Fk. Clearwater R.			2					
2011-CLFH-SFCR-S. Fk. Clearwater R.			4		1			
2012-CLFH-SFCR-S. Fk. Clearwater R.			1					
2011-DNFH-DWOR-Clearwater R.	3		98	39				
2012-DNFH-DWOR-Clearwater R.	1		11	12				
2011-HNFH-SAW-Upper Salmon R.	3		1				19	
2011-HNFH-SAW-Yankee Fork R.							2	
2012-HNFH-SAW-Upper Salmon R.	11		1			5	51	
2012-HNFH-SAW-Yankee Fork R.							4	
2011-MVFH-PAH-Little Salmon R.	1					8	5	1
2011-MVFH-PAH- Salmon R. below Pahsimeroi R.	1					1	8	
2012-MVFH-PAH-Little Salmon R.	4					22	3	3
2012-MVFH-PAH- Salmon R. below Pahsimeroi R.	2					4	3	
2011-MVFH-SAW-Upper Salmon R.			1				2	
2011-MVFH-USAL-Little Salmon R.	1					5		1
2011-MVFH-USAL-E. Fk. Salmon R./Pahsimeroi R.	2					6	4	
2011-MVFH-USAL-Little Salmon R./Pahsimeroi R.	5					4		
2011-MVFH-USAL-Pahsimeroi R./Upper Salmon R.	1					4	8	
2012-MVFH-USAL-Little Salmon R.						2	1	
2012-MVFH-USAL-Pahsimeroi R./Upper Salmon R.								1
2010-NSFH-PAH-Little Salmon R.						1		
2011-NSFH-PAH-Little Salmon R.			1			15	3	

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2011-NSFH-PAH-Pahsimeroi R.	3	1				4	24	
2012-NSFH-PAH-(blank)	1							
2012-NSFH-PAH-Hells Canyon	17	33	1			4		
2012-NSFH-PAH-Little Salmon R.	12					43	3	1
2012-NSFH-PAH-Pahsimeroi R.	4					6	22	
2011-NSFH-OX-Hells Canyon	15	46	1			3		
2011-NSFH-OX-Little Salmon R.	3		1			17	15	
2011-NSFH-OX-Hells Canyon/Little Salmon	1	2				11	7	
2012-NSFH-OX-Hells Canyon		16	1					
2011-IFH-IMNA-Imnaha R. OR	8	17	1			5		
2012-IFH-IMNA-Imnaha R. OR	14	26	5			5		
2011-IFH-WALL-Grande Ronde R. OR	9	7	2			1		
2012-IFH-WALL-Grande Ronde R. OR	14	2	2					
2011-LFFH-LYON-Lyons Ferry WA	3		5					
2012-LFFH-LYON-Lyons Ferry WA	7		6					
2011-LFFH-WALL-Grande Ronde R. WA	8	2				1		
2012-LFFH-WALL-Grande Ronde R. WA	10	2	2			2		
Unassigned	2	14	4	3	-	-	-	-
Total	**168**	**168**	**176**	**57**	**2**	**180**	**185**	**6**

Appendix C4. Number of tissue samples analyzed using PBT to estimate the stock composition of the adult steelhead harvest from the spring of 2015 recreational fishery (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, LFFH=Washington's Lyon's Ferry Fish Hatchery).

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19	Little Salmon Sect. 20
2011-CLFH-DWOR-S. Fk. Clearwater R.			20	6	41				
2012-CLFH-DWOR-S. Fk. Clearwater R.				1					
2011-CLFH-SFCR-S. Fk. Clearwater R.			4		11				
2012-CLFH-SFCR-S. Fk. Clearwater R.					1				
2011-DNFH-DWOR-Clearwater R.	1	1	140	97	49				
2012-DNFH-DWOR-Clearwater R.			8	9	3				
2010-HNFH-SAW-Upper Salmon R.								1	
2011-HNFH-SAW-Upper Salmon R.		1				3	15	48	
2011-HNFH-SAW-Yankee Fork R.						1	1	6	
2012-HNFH-SAW-Upper Salmon R.	1	1				6	47	113	
2012-HNFH-SAW-Yankee Fork R.						1	10	12	
2011-MVFH-PAH-Little Salmon R.						8			18
2011-MVFH-PAH- Salmon R. below Pahsimeroi R.						4	11		
2012-MVFH-PAH-Little Salmon R.	2					13	1		32
2012-MVFH-PAH- Salmon R. below Pah						2	8	1	
2011-MVFH-SAW-Upper Salmon R.						1			
2011-MVFH-USAL-Little Salmon R.	1	1				8	1		8
2011-MVFH-USAL-E. Fk. Salmon R./Pahsimeroi R.	1	1	1	1		19	9		1
2011-MVFH-USAL-Little Salmon R./Pahsimeroi R.	1	1				8			13
2011-MVFH-USAL-Pahsimeroi R./Upper Salmon R.	1	1				7	3	2	
2012-MVFH-USAL-Little Salmon R.						2			1
2012-MVFH-USAL-Yankee Fork R.								1	
2012-MVFH-USAL-Pahsimeroi R./Upper Salmon R.						1	1		

Smolt Release Group (BY-Hatchery-Stock-Release)	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Salmon Sect. 18-19	Little Salmon Sect. 20
2011-NSFH-PAH-Little Salmon R.						8	1		23
2011-NSFH-PAH-Pahsimeroi R.	1					6	21		
2012-NSFH-PAH-Unknown		1							
2012-NSFH-PAH-Hells Canyon	11	65	1				1		
2012-NSFH-PAH-Little Salmon R.	8	3				53	2		57
2012-NSFH-PAH-Pahsimeroi R.	1					6	38		
2011-NSFH-OX-Hells Canyon	1	27				2			
2011-NSFH-OX-Little Salmon R.						9	3		22
2011-NSFH-OX-Hells Canyon/Little Salmon R.		2					1		14
2012-NSFH-OX-Hells Canyon		4							
2011-IFH-IMNA-Imnaha R. OR	8	15				3			
2012-IFH-IMNA-Imnaha R. OR	13	27				5			
2011-IFH-WALL-Grande Ronde R. OR	1	1	1			3	1		
2012-IFH-WALL-Grande Ronde R. OR	4								
2011-LFFH-WALL-Grande Ronde R. WA	2								
2012-LFFH-WALL-Grande Ronde R. WA	5	2				1			
Unassigned	3	20	4	4	7	5	6	-	-
Total	**67**	**175**	**179**	**119**	**111**	**186**	**183**	**184**	**188**

Appendix C5. A comparison of angler harvest estimates of the steelhead stock composition between CWT recoveries and PBT analysis from fish harvested in the fall of 2014, broken down by brood year, hatchery, stock, and release basin (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, UFH=Oregon's Umatilla Fish Hatchery, CWFH=Washington's Cottonwood Fish Hatchery, LFFH=Washington's Lyon's Ferry Fish Hatchery, TUFH=Washington's Tucannon Fish Hatchery).

Smolt Release Group (BY-Hatchery-Stock-Release)	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2010-CLFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	34	-	-	-	-	-
2011-CLFH-DWOR-S. Fk. Clearwater R.	CWT	15	-	1,105	-	116	-	-	-
2011-CLFH-DWOR-S. Fk. Clearwater R.	PBT	-	-	838	34	54	-	-	-
2011-CLFH-SFCR-S. Fk. Clearwater R.	PBT	-	-	126	-	62	-	-	-
2012-CLFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	40	-	-	-	-	-
2012-CLFH-DWOR-S. Fk. Clearwater R.	PBT	-	-	75	-	-	-	-	-
2012-CLFH-SFCR-S. Fk. Clearwater R.	CWT	3	-	48	-	-	-	-	-
2012-CLFH-SFCR-S. Fk. Clearwater R.	PBT	-	-	36	-	-	-	-	-
2011-DNFH-DWOR-Clearwater R.	PBT	50	-	3,534	435	-	-	-	-
2011-DNFH-DWOR-N. Fk. Clearwater R.	CWT	69	-	2,594	643	-	-	-	-
2011-DNFH-DWOR-S. Fk. Clearwater R.	CWT	17	-	1,112	-	-	-	-	-
2012-DNFH-DWOR-Clearwater R.	PBT	17	-	411	141	-	-	-	-
2012-DNFH-DWOR-N. Fk. Clearwater R.	CWT	-	-	460	-	-	-	-	-
2012-DNFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	230	-	-	-	-	-
2011-HNFH-SAW-Upper Salmon R.	CWT	38	-	-	-	-	-	656	-
2011-HNFH-SAW-Upper Salmon R.	PBT	50	-	36	-	-	-	606	-
2011-HNFH-SAW-Yankee Fork R.	CWT	-	-	-	-	-	-	83	-
2011-HNFH-SAW-Yankee Fork R.	PBT	-	-	-	-	-	-	64	-
2012-HNFH-EFNAT-E. Fk. Salmon R.	CWT	2	-	-	-	-	-	-	-
2012-HNFH-SAW-Upper Salmon R.	CWT	191	52	9	-	-	224	1,606	-
2012-HNFH-SAW-Upper Salmon R.	PBT	182	-	36	-	-	125	1,622	-
2012-HNFH-SAW-Yankee Fork R.	CWT	6	19	-	-	-	-	514	-
2012-HNFH-SAW-Yankee Fork R.	PBT	-	-	-	-	-	-	127	-

Smolt Release Group (BY-Hatchery-Stock-Release)	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2010-MVFH-PAH-Upper Salmon R.	CWT	-	-	-	-	-	15	-	-
2011-MVFH-PAH-Little Salmon R.	CWT	9	-	-	-	-	331	43	128
2011-MVFH-PAH-Little Salmon R.	PBT	21	-	-	-	-	189	160	87
2011-MVFH-PAH-Upper Salmon R.	CWT	19	-	19	-	-	59	177	-
2011-MVFH-PAH-Upper Salmon R.	PBT	21	-	-	-	-	31	240	-
2011-MVFH-SAW-Upper Salmon R.	CWT	6	-	-	-	-	-	186	-
2011-MVFH-SAW-Upper Salmon R.	PBT	-	-	36	-	-	-	64	-
2011-MVFH-USAL-E. Fk. Salmon R.	CWT	32	-	-	-	-	141	97	-
2011-MVFH-USAL-E. Fk. Salmon/Pahsimeroi R.	PBT	34	-	-	-	-	152	129	-
2011-MVFH-USAL-Little Salmon R.	CWT	56	8	11	-	-	96	-	-
2011-MVFH-USAL-Little Salmon R.	PBT	17	-	-	-	-	127	-	70
2011-MVFH-USAL-Little Salmon/Pahsimeroi R.	PBT	84	-	-	-	-	101	-	-
2011-MVFH-USAL-Pahsimeroi R.	CWT	-	-	-	-	-	8	-	-
2011-MVFH-USAL-Pahsimeroi/Upper Salmon R.	PBT	17	-	-	-	-	101	258	-
2011-MVFH-USAL-Upper Salmon R.	CWT	6	-	28	-	-	71	193	-
2012-MVFH-PAH-Little Salmon R.	CWT	61	11	-	-	-	443	25	-
2012-MVFH-PAH-Little Salmon R.	PBT	68	-	-	-	-	559	97	210
2012-MVFH-PAH-Upper Salmon R.	CWT	50	7	-	-	-	59	434	-
2012-MVFH-PAH-Upper Salmon R.	PBT	34	-	-	-	-	102	97	-
2012-MVFH-USAL-Little Salmon R.	CWT	3	-	-	-	-	18	25	-
2012-MVFH-USAL-Little Salmon R.	PBT	-	-	-	-	-	52	33	-
2012-MVFH-USAL-Pahsimeroi/Upper Salmon R.	PBT	-	-	-	-	-	-	33	-
2012-MVFH-USAL-Upper Salmon R.	CWT	-	-	-	-	-	-	32	-
2010-NSFH-OX-Hells Canyon	CWT	-	30	-	-	-	-	-	-
2010-NSFH-PAH-Little Salmon R.	PBT	-	-	-	-	-	26	-	-
2011-NSFH-OX-Hells Canyon	CWT	120	282	37	-	-	46	-	-
2011-NSFH-OX-Hells Canyon	PBT	252	371	39	-	-	81	-	-
2011-NSFH-OX-Hells Canyon/Little Salmon R.	PBT	18	18	-	-	-	271	207	-

Smolt Release Group (BY-Hatchery-Stock-Release)	Tag Type	Snake Sect. 01	Snake Sect. 02	Clearwater Sect. 03-04	N. Fk. Clearwater Sect. 05	S. Fk. Clearwater Sect. 07	Salmon Sect. 10-12	Salmon Sect. 13-17	Little Salmon Sect. 20
2011-NSFH-OX-Little Salmon R.	CWT	75	50	-	-	-	898	447	-
2011-NSFH-OX-Little Salmon R.	PBT	54	-	39	-	-	434	484	-
2011-NSFH-PAH-Little Salmon R.	CWT	31	-	-	-	-	389	152	-
2011-NSFH-PAH-Little Salmon R.	PBT	-	-	45	-	-	377	80	-
2011-NSFH-PAH-Pahsimeroi R.	CWT	27	-	58	-	-	-	500	-
2011-NSFH-PAH-Pahsimeroi R.	PBT	42	10	-	-	-	94	761	-
2012-NSFH-OX-Hells Canyon	CWT	25	102	-	-	-	-	-	-
2012-NSFH-OX-Hells Canyon	PBT	-	132	36	-	-	-	-	-
2012-NSFH-PAH-Pahsimeroi/Little Salmon R.	PBT	17	-	-	-	-	-	-	-
2012-NSFH-PAH-Hells Canyon	CWT	172	309	-	-	-	255	-	-
2012-NSFH-PAH-Hells Canyon	PBT	287	265	37	-	-	102	-	-
2012-NSFH-PAH-Little Salmon R.	CWT	189	23	-	-	-	798	156	309
2012-NSFH-PAH-Little Salmon R.	PBT	203	-	-	-	-	1,068	97	70
2012-NSFH-PAH-Pahsimeroi R.	CWT	159	-	-	-	-	199	546	-
2012-NSFH-PAH-Pahsimeroi R.	PBT	68	-	-	-	-	153	713	-
2011-IFH-IMNA-Imnaha R. OR	CWT	132	198	154	-	-	65	-	-
2011-IFH-IMNA-Imnaha R. OR	PBT	132	138	36	-	-	125	-	-
2011-IFH-WALL-Grande Ronde R. OR	CWT	267	41	77	-	-	20	-	-
2011-IFH-WALL-Grande Ronde R. OR	PBT	152	58	73	-	-	25	-	-
2012-IFH-IMNA-Imnaha R. OR	CWT	296	222	-	-	-	366	-	-
2012-IFH-IMNA-Imnaha R. OR	PBT	225	213	188	-	-	130	-	-
2012-IFH-WALL-Grande Ronde R. OR	CWT	272	11	29	-	-	-	-	-
2012-IFH-WALL-Grande Ronde R. OR	PBT	234	16	72	-	-	-	-	-
2011-UFH-UMA-Umatilla R.	CWT	4	-	17	-	-	-	-	-
2011-CWFH-WALL-Grande Ronde R. WA	CWT	130	-	-	-	-	-	-	-
2012-CWFH-WALL-Grande Ronde R. WA	CWT	227	-	61	-	-	-	-	-
2011-LFFH-LYON-Lyons Ferry WA	PBT	50	-	179	-	-	-	-	-
2011-LFFH-WALL-Grande Ronde R. WA	PBT	138	17	-	-	-	26	-	-

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2011-LFFH-LYON-Lyons Ferry WA	CWT	10	-	36	-	-	-	-	-
2012-LFFH-LYON-Lyons Ferry WA	CWT	54	-	61	-	-	-	-	-
2012-LFFH-LYON-Lyons Ferry WA	PBT	116	-	215	-	-	-	-	-
2012-LFFH-WALL-Grande Ronde R. WA	PBT	166	16	72	-	-	50	-	-
2011-TUFH-LYON-Touchet R.	CWT	-	-	45	-	-	-	-	-
2011-TUFH-TUC-Tucannon R.	CWT	-	-	6	-	-	-	-	-
2012-TUFH-LYON-Touchet R Below Snake WA	CWT	12	-	51	-	-	-	-	-
Unassigned	PBT	36	111	158	33	-	-	-	-

Appendix C6. A comparison of angler harvest estimates of the steelhead stock composition between CWT recoveries and PBT analysis from fish harvested in the spring of 2015, broken down by brood year, hatchery, and stock (CLFH=Clearwater Fish Hatchery, DNFH=Dworshak National Fish Hatchery, HNFH=Hagerman National Fish Hatchery, MVFH=Magic Valley Fish Hatchery, NSFH=Niagara Springs Fish Hatchery, IFH=Oregon's Irrigon Fish Hatchery, CWFH=Washington's Cottonwood Fish Hatchery, LFFH=Washington's Lyon's Ferry Fish Hatchery, TUFH=Washington's Tucannon Fish Hatchery).

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2011-CLFH-DWOR-S. Fk. Clearwater R.	PBT	-	-	563	107	780	-	-	-	-
2011-CLFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	598	25	873	-	-	-	-
2011-CLFH-SFCR-S. Fk. Clearwater R.	PBT	-	-	97	-	202	-	-	-	-
2011-CLFH-SFCR-S. Fk. Clearwater R.	CWT	-	-	4	-	32	-	-	-	-
2012-CLFH-DWOR-S. Fk. Clearwater R.	PBT	-	-	-	18	-	-	-	-	-
2012-CLFH-SFCR-S. Fk. Clearwater R.	PBT	-	-	-	-	19	-	-	-	-
2012-CLFH-SFCR-S. Fk. Clearwater R.	CWT	-	-	-	-	63	8	-	-	-
2011-DNFH-DWOR-Clearwater R.	PBT	10	3	3,883	1,707	936	-	-	-	-
2011-DNFH-DWOR-N. Fk. Clearwater R.	CWT	-	-	3,578	1,688	-	-	-	-	-
2011-DNFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	580	89	1,164	-	-	-	-
2012-DNFH-DWOR-Clearwater R.	PBT	-	-	231	164	60	-	-	-	-
2012-DNFH-DWOR-N. Fk. Clearwater R.	CWT	-	-	150	276	-	-	-	-	-
2012-DNFH-DWOR-S. Fk. Clearwater R.	CWT	-	-	50	-	-	-	-	-	-
2010-HNFH-SAW-Upper Salmon R.	PBT	-	-	-	-	-	-	-	8	-
2010-HNFH-SAW-Yankee Fork R.	CWT	-	-	-	-	-	-	-	14	-
2011-HNFH-SAW-Upper Salmon R.	PBT	-	3	-	-	-	27	309	388	-
2011-HNFH-SAW-Upper Salmon R.	CWT	-	-	-	-	-	71	100	193	-
2011-HNFH-SAW-Yankee Fork R.	PBT	-	-	-	-	-	9	21	48	-
2011-HNFH-SAW-Yankee Fork R.	CWT	-	-	-	-	-	-	-	29	-
2012-HNFH-SAW-Upper Salmon R.	PBT	10	3	-	-	-	54	966	910	-
2012-HNFH-SAW-Upper Salmon R.	CWT	-	-	-	-	-	78	1,088	998	-
2012-HNFH-SAW-Upper Salmon R.	CWT	-	5	-	-	-	-	81	16	-

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2012-HNFH-SAW-Yankee Fork R.	PBT	-	-	-	-	-	9	206	97	-
2012-HNFH-SAW-Yankee Fork R.	CWT	-	-	-	-	-	-	182	220	-
2011-MVFH-USAL-E. Fk. Salmon R.	CWT	-	-	-	-	-	74	154	-	-
2011-MVFH-USAL-Little Salmon R.	CWT	15	24	-	-	-	114	20	-	210
2011-MVFH-USAL-Upper Salmon R.	CWT	-	15	-	-	-	74	154	-	-
2011-MVFH-PAH-Little Salmon R.	PBT	-	-	-	-	-	68	-	-	268
2011-MVFH-PAH-Little Salmon R.	CWT	-	-	-	-	-	49	-	-	271
2011-MVFH-PAH- Salmon R. below Pahsimeroi R.	CWT	-	-	-	-	-	37	291	-	-
2011-MVFH-PAH- Salmon R. below Pahsimeroi R.	PBT	-	-	-	-	-	34	233	-	-
2011-MVFH-SAW-Upper Salmon R.	PBT	-	-	-	-	-	9	-	-	-
2011-MVFH-SAW-Upper Salmon R.	CWT	-	-	-	-	-	22	46	15	-
2011-MVFH-USAL-E. Fk. Salmon R./Pahsimeroi R.	PBT	10	3	28	18	-	174	188	-	15
2011-MVFH-USAL-Little Salmon R.	PBT	10	3	-	-	-	73	21	-	123
2011-MVFH-USAL-Little Salmon R./Pahsimeroi R.	PBT	10	3	-	-	-	73	-	-	200
2011-MVFH-USAL-Pahsimeroi R./Upper Salmon R.	PBT	10	3	-	-	-	64	63	16	-
2011-MVFH-USAL-Upper Salmon R.	CWT	-	-	-	-	-	8	-	-	-
2012-MVFH-USAL-Little Salmon R.	CWT	-	-	-	-	-	19	-	-	35
2012-MVFH-PAH-Little Salmon R.	PBT	20	-	-	-	-	120	21	-	479
2012-MVFH-PAH-Little Salmon R.	CWT	20	-	-	-	-	192	27	-	247
2012-MVFH-PAH- Salmon R. below Pahsimeroi R.	CWT	-	-	-	-	-	24	479	-	-
2012-MVFH-PAH- Salmon R. below Pahsimeroi R.	PBT	-	-	-	-	-	18	168	8	-
2012-MVFH-USAL-Little Salmon R.	PBT	-	-	-	-	-	19	-	-	16
2012-MVFH-USAL-Pahsimeroi R./Upper Salmon R.	PBT	-	-	-	-	-	9	21	-	-
2012-MVFH-USAL-Yankee Fork R.	PBT	-	-	-	-	-	-	-	8	-
2011-NSFH-OX-Hells Canyon	PBT	11	91	-	-	-	20	-	-	-
2011-NSFH-OX-Hells Canyon	CWT	51	80	-	-	-	-	-	-	-
2011-NSFH-OX-Hells Canyon/Little Salmon	PBT	-	7	-	-	-	-	22	-	214
2011-NSFH-OX-Little Salmon	CWT	-	-	-	-	-	85	-	-	468

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2011-NSFH-OX-Little Salmon R.	PBT	-	-	-	-	-	79	67	-	330
2011-NSFH-PAH-Little Salmon R.	PBT	-	-	-	-	-	68	26	-	344
2011-NSFH-PAH-Little Salmon R.	CWT	-	-	-	-	-	-	-	-	532
2011-NSFH-PAH-Pahsimeroi R.	CWT	80	-	-	-	-	76	213	-	-
2011-NSFH-PAH-Pahsimeroi R.	PBT	12	-	-	-	-	57	440	-	-
2012-NSFH-OX-Hells Canyon	PBT	-	14	-	-	-	-	-	-	-
2012-NSFH-OX-Hells Canyon	CWT	-	15	-	-	-	-	-	-	-
2012-NSFH-PAH-Pahsimeroi R./Little Salmon R.	PBT	-	3	-	-	-	-	-	-	-
2012-NSFH-PAH-Hells Canyon	PBT	108	217	28	-	-	-	21	-	-
2012-NSFH-PAH-Hells Canyon	CWT	93	257	-	-	-	-	-	-	-
2012-NSFH-PAH-Little Salmon R.	PBT	79	10	-	-	-	479	42	-	866
2012-NSFH-PAH-Little Salmon R.	CWT	83	-	-	-	-	673	55	-	1,091
2012-NSFH-PAH-Pahsimeroi R.	PBT	10	-	-	-	-	55	775	-	-
2012-NSFH-PAH-Pahsimeroi R.	CWT	72	-	-	-	-	-	872	-	-
2011-IFH-IMNA-Imnaha R. OR	PBT	77	50	-	-	-	27	-	-	-
2011-IFH-IMNA-Imnaha R. OR	CWT	71	28	-	-	-	-	-	-	-
2011-IFH-WALL-Grande Ronde R. OR	PBT	10	3	28	-	-	28	21	-	-
2012-IFH-IMNA-Imnaha R. OR	PBT	121	91	-	-	-	47	-	-	-
2012-IFH-IMNA-Imnaha R. OR	CWT	80	158	-	-	-	76	-	-	-
2012-IFH-WALL-Grande Ronde R. OR	PBT	39	-	-	-	-	-	-	-	-
2012-CWFH-WALL-Grande Ronde R. WA	CWT	84	-	-	-	-	-	-	-	-
2011-LFFH-WALL-Grande Ronde R. WA	PBT	20	-	-	-	-	-	-	-	-
2012-LFFH-WALL-Grande Ronde R. WA	PBT	48	7	-	-	-	9	-	-	-
2011-TUFH-TUC-Tucannon R-Snake R WA	CWT	-	-	-	7	-	-	-	-	-
Unassigned	PBT	34	67	104	71	135	50	131	-	-

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