

LSRCP Steelhead Hatchery Mitigation Program
Salmon River, Idaho
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This report describes the steelhead hatchery mitigation program in the Salmon River, Idaho that is part of the Lower Snake River Compensation Program (LSRCP). Information includes: a description of Idaho Department of Fish and Game (IDFG) management objectives, description and status of natural populations, background and history of the hatchery program, description of how successful the hatchery program has been in achieving objectives, and a description of the current and future management focus. While not part of this program review, the hatchery steelhead mitigation program for the Hells Canyon hydroelectric complex funded by the Idaho Power Company (IPC) is introduced to provide context and scope for the entire steelhead hatchery mitigation effort within the Salmon River drainage.

Management Objectives and Framework for the Salmon River

The Salmon River is one of the largest tributaries in the Snake River and encompasses approximately 14,100 square miles along its 425 mile route and 7,000 ft. elevation change between the mouth and headwaters. Major tributaries of the Salmon River include the East Fork, Pahsimeroi, Lemhi, North Fork, Middle Fork, South Fork, and Little Salmon rivers (Figure 1). The Salmon River and its tributaries once supported robust wild populations of steelhead. In 1974, fisheries targeting wild steelhead in the Salmon River were terminated due to dwindling returns of wild steelhead. In 1997, the Snake River steelhead DPS was listed as threatened under the ESA.

The Idaho Department of Fish and Game (IDFG) statewide management objectives include restoring and maintaining natural populations of steelhead in the Salmon River. Objectives for the hatchery steelhead program are to meet the LSRCP adult mitigation objectives, to restore and maintain recreational and tribal steelhead fisheries, to minimize impacts of the hatchery program on natural populations, and to evaluate the use of hatchery supplementation as a tool to aid in the recovery of natural populations. The primary objective of the steelhead hatchery program is to meet harvest mitigation objectives. As such, the hatchery program is managed as a segregated program intended to maximize smolt to adult survival rates while at the same time minimize interaction with natural populations.

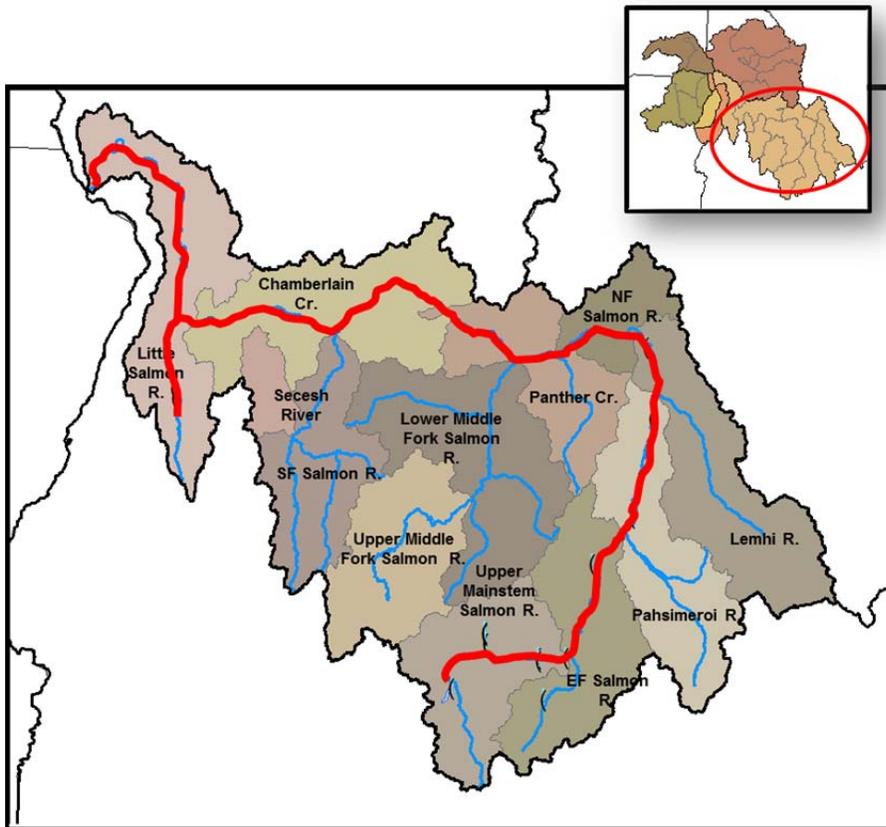


Figure 1. Map of the Salmon River steelhead Major Population Group (MPG) and twelve independent populations and major tributaries.

The IDFG management framework for steelhead includes confining the release of hatchery production to areas it is likely to have the least impact on natural populations. Within the Salmon River sub-basin, hatchery releases of summer steelhead are confined to sections of the Salmon River upstream of North Fork Salmon River (upper Salmon River) and to the Little Salmon River (Figure 2). There are no hatchery releases in the North Fork Salmon, Middle Fork Salmon, South Fork Salmon, and mainstem Salmon River downstream of the North Fork Salmon River. IDFG managers have maintained this strategy throughout the history of the hatchery program.

Approximately one half of the LSRCP steelhead mitigation for the entire Snake River and approximately 70% of the Hells Canyon hatchery mitigation occurs within the Salmon River drainage. Managers realize that with a hatchery program this large it is impossible to completely isolate hatchery steelhead from natural populations in areas adjacent to hatchery release sites. Given these conditions, managers have chosen to operate the hatchery program in locations selected to minimize impacts to natural populations. The Little Salmon River, a tributary to the Salmon River near the town of Riggins, ID, is an example of a terminal area hatchery release site that provides good angler accessibility to adult returns. The upper Salmon River (upstream of North Fork Salmon River) receives the remaining LSRCP hatchery smolt releases (Figure2). Little information is available regarding the historic abundance of wild

steelhead in the upper Salmon River but based on elevation and habitat characteristic, it is likely that the upper Salmon River never supported large populations of wild steelhead. The upper Salmon River provides excellent angler access and fishing opportunity from October through April.

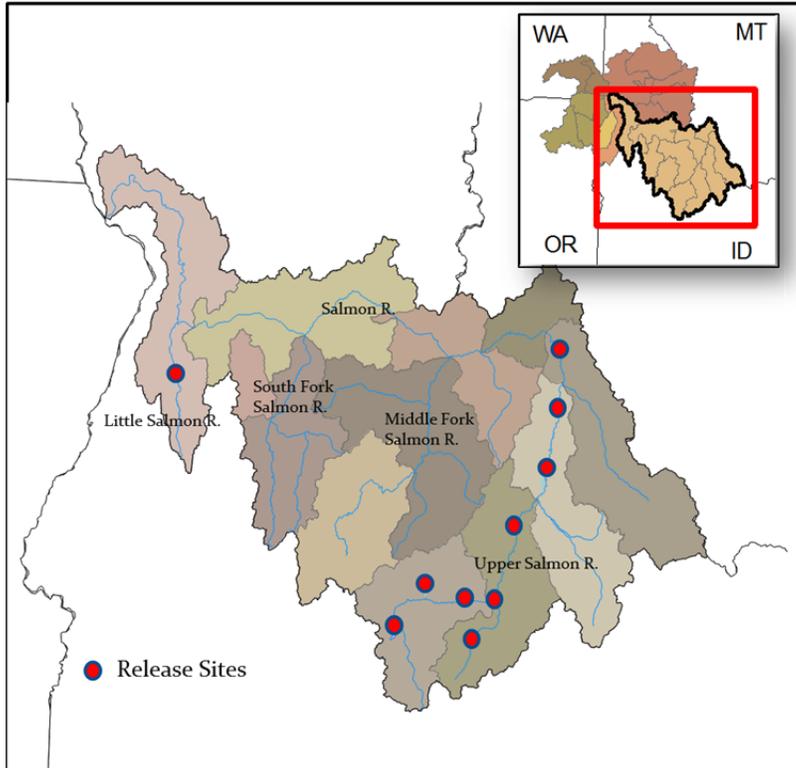


Figure 2. Release Sites for hatchery steelhead that are part of the LSRCP hatchery mitigation program

Status of Natural Populations

Steelhead in the Salmon River basin have been classified into twelve demographically independent populations (Figure 1) (ICTRT 2003). Currently, all twelve populations of steelhead in the Salmon River Major Population Group (MPG) fail to meet the viability criteria established by the Interior Columbia Technical Recovery Team (ICTRT). All populations are currently classified at moderate to high risk for abundance and productivity measures. This is partially due to the lack of population specific abundance and productivity data. The twelve populations are rated at low to moderate risk for spatial structure and diversity measures. While population specific abundance and productivity data is currently lacking, managers are focusing effort to estimate these parameters through the use of genetic analysis and PIT tagging technologies.

Mitigation Goals and Hatchery Program Background

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. Total mitigation expected for the LSRCP is 165,300 adults to be produced annually. This is based on an assumed 2:1 ratio of catch (downstream of project area; Lower Granite Dam) to escapement (upstream of the project area) (Corps of Engineers, 1975). During the program development, it was anticipated that the majority of the harvest mitigation benefits would be distributed downstream of the project area. However, less than expected returns of hatchery fish produced within the program and the depressed status of natural-origin fish influenced Columbia River fisheries management programs. The anticipated 2:1 distribution of harvest benefits downstream: upstream of Lower Granite Dam has not been realized. Regardless of the actual distribution of harvest benefits, it was anticipated that the Salmon River steelhead hatchery program would contribute 75,780 (46% of total) adults annually towards the total LSRCP mitigation goal (Table 1). To achieve the adult goals, smolt to adult survival rates (SARs) were modeled and used to size the hatchery facilities.

For the LSRCP hatchery program operated within the Salmon River drainage, two primary hatchery facilities are operated; Magic Valley Fish Hatchery (MVFH) and Hagerman National Fish Hatchery (HNFH). Smolt to adult survival rates (SARs) used to size the program specified the need for a release of approximately 3.45 million smolts to produce 75,780 adults annually. Currently, 2.9 million smolts are released in the Salmon River. A reduction in spring flows at both MVFH and HNFH currently limits the smolt production. Managers are exploring options to mitigate for the loss of spring water to bring the facilities back to the original production capacity specifications.

Table 1. Mitigation goals and smolt releases for the LSRCP hatchery steelhead program in the Salmon River, ID.

	Magic Valley Fish Hatchery	Hagerman National Fish Hatchery	Total
Adult Goal- Project Area	11,660	13,600	25,260
Adult Goal- Downstream of Project Area	23,320	27,200	50,520
Total Adult Mitigation Goal	34,980	40,800	75,780
Smolt Release Target	1,749,000	1,700,000	3,449,000
Actual Smolts Released	1,540,000	1,360,000	2,900,000
IPC smolts Released in Salmon R			1,275,000
Total Steelhead Smolts Released in the Salmon River			4,175,000

While not part of this hatchery review, another hatchery mitigation program is also operated within the Salmon River and is funded by the Idaho Power Company (IPC). This program is operated to mitigate for the loss of anadromous steelhead resulting from the construction and operation of the Hells Canyon hydroelectric complex (Brownlee, Oxbow, and Hells Canyon dams) on the Snake River. In addition to the 2.9 million smolts released as part of the LSRCP program, 1.275 million smolts from the Hells Canyon mitigation are also released within the Salmon River basin for a total of 4.175 million smolts (Table 1).

Hatchery Steelhead Broodstock History in the Salmon River

Hatchery steelhead broodstocks used in the Salmon River include both A-run and B-run stocks. These run type designations were originally established by managers of fisheries in the Columbia River to manage stock groups in two modes of a bimodal temporal distribution of migrating adult summer steelhead but for the purpose of this report, the A-run and B-run designations are used to describe the predominant life history exhibited by each stock. Stocks that are referred to as A-Run return predominantly as one-ocean adults and those referred to as B-run return predominantly as larger two-ocean adults. Both life history types occur naturally in the Salmon River. Since the beginning of steelhead hatchery program in the Salmon River, managers have desired to maintain both run types for the harvest mitigation program.

A-Run Broodstock Development

Snake River steelhead trapped below Hells Canyon Dam were first transferred to the upper Salmon River at Pahsimeroi Fish Hatchery in 1966 as part of the Hells Canyon steelhead mitigation program funded by IPC. When the Sawtooth Fish Hatchery was constructed in 1985 as part of the LSRCP mitigation program, steelhead broodstock from Pahsimeroi Fish Hatchery were used to found the broodstock for this program. Since 2000, steelhead broodstock at Sawtooth Fish Hatchery has been sourced exclusively from adults returning to Sawtooth Fish Hatchery.

B-Run Broodstock Development

Broodstock from Dworshak National Fish Hatchery (DNFH) in the Clearwater River was first transferred to the Salmon River in 1973 at Pahsimeroi Fish Hatchery in an effort to develop a hatchery B-run program in the Salmon River. Later, the broodstock was moved to the E.F. Salmon River and more recently has been shifted to Squaw Creek in the upper Salmon River. Increased efforts are currently underway to expand the development of the locally adapted Salmon River B-run hatchery broodstock and phase out the use of DNFH broodstock in the Salmon River.

Description of the Hatchery Steelhead Program in the Salmon River

The hatchery steelhead program within the Salmon River basin is composed of four primary components (Table 2). Fish culture associated with this program includes several hatcheries at some part of the life stage but final rearing for all Salmon River smolt releases that are part of the LSRCP program occurs at Magic Valley Fish Hatchery (MVFH) and at Hagerman National Fish Hatchery (HNFH). Both of these hatchery facilities are located on the Snake River near the town of Hagerman, ID. Within the Salmon River, a combined 2.9 million smolts are released from HNFH and MVFH across the four hatchery components (Table 2). Additionally, 1.275 million smolts are released from Niagara Springs Fish Hatchery (NSFH) as part of the hatchery mitigation program funded by IPC. The following section provides background information for each of the four LSRCP funded hatchery components in the Salmon River.

Table 2. Hatchery steelhead smolt releases in the Salmon River that are part of the LSRCP and IPC hatchery mitigation programs.

Salmon River Hatchery Program Component	LSRCP Hatchery Steelhead Smolt Releases	IPC Hatchery Steelhead Smolt Releases	Total Release
Little Salmon R. A and B-Run	415,000	445,000	860,000
Upper Salmon R. A-Run	1,580,000	830,000	2,410,000
Upper Salmon River B-Run	735,000	0	735,000
East Fork Salmon R.	170,000	0	170,000
Total Release	2,900,000	1,275,000	4,175,000

Little Salmon River

The ICTRT defined Little Salmon River steelhead population includes the Little Salmon River, its tributaries, and the mainstem Salmon River and its tributaries downstream of the Little Salmon River to the mouth of the Salmon River (Figure 3). Production and productivity data for natural steelhead within the Little Salmon population is limited. An adult trap located on Rapid River, a major tributary to the Little Salmon River, is operated as part of the IPC spring Chinook salmon hatchery program and is operated during the steelhead run to monitor natural steelhead escapement. All natural steelhead trapped in Rapid River are passed upstream to spawn naturally. No hatchery-origin steelhead are passed upstream of the trap. All hatchery releases (both LSRCP and IPC) within the Little Salmon population occur on the mainstem of the Little Salmon River upstream of the confluence with Rapid River (Figure 3).

Little Salmon River A-Run and B-Run Component

The hatchery steelhead program operated in the Little Salmon River is managed strictly for harvest mitigation. There is no adult trapping facility on the Little Salmon River and all 415,000 hatchery smolts released into the Little Salmon River that are part of the LSRCP program originating from A-run program based on adults trapped at Pahsimeroi Fish Hatchery and a B-run program based on adults trapped at Dworshak National Fish Hatchery. Managers are planning to phase out the releases of B-run smolts from DNFH and replace them with a B-run that is locally adapted to the Salmon River (see Upper Salmon B-Run Component below)

In addition to the LSRCP funded hatchery program in the Little Salmon River, 445,000 smolts that are part of the Hells Canyon mitigation program funded by IPC are also released into the Little Salmon River. These smolts are progeny of adults trapped at Pahsimeroi Fish Hatchery on the Salmon River and at the Hells Canyon trap on the Snake River.

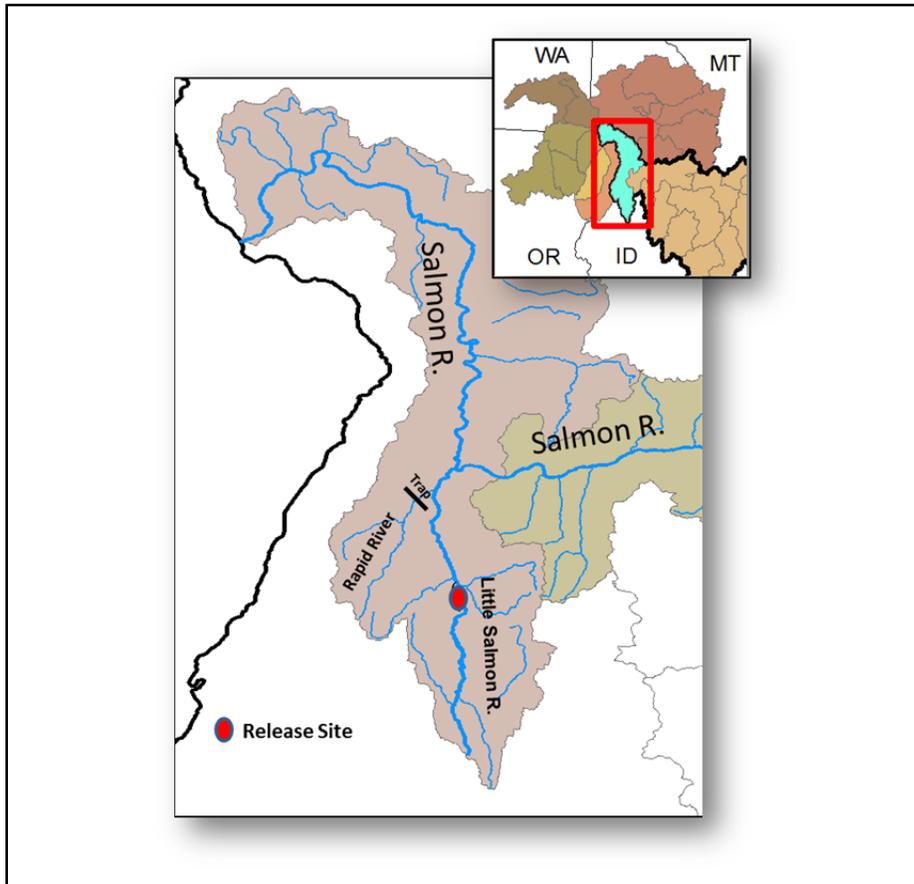


Figure 3. Little Salmon River steelhead TRT population and hatchery steelhead smolt release site.

Upper Salmon River

The ICTRT identified four independent steelhead populations (Lemhi River, Pahsimeroi River, East Fork Salmon River, and upper Salmon River mainstem) upstream from the North Fork Salmon River (Figure 4). Historic abundance and productivity data for natural steelhead within these populations are limited but managers are working to build programs to collect more abundance and productivity data for natural populations within the upper Salmon River. In the Lemhi River, in-stream PIT tag arrays are in operation and, in conjunction with adult steelhead PIT tagging at Lower Granite Dam, are used to estimate of the number of natural steelhead escaping into the Lemhi River. Similarly, newly installed PIT tag arrays in the mainstem Salmon River near the town of Salmon will also provide information to estimate the number of natural steelhead in aggregate that are destined for natural production areas upstream of the Lemhi River. A hatchery trap operated on the Pahsimeroi River is used to enumerate the number of natural-origin adults in the Pahsimeroi River. A hatchery trap operated in the East Fork Salmon River is used to enumerate the number of natural-origin steelhead arriving at the trap. A PIT tag array in the Yankee Fork Salmon River in conjunction with PIT tagging of adult steelhead at Lower Granite Dam is used to estimate the escapement of natural steelhead into the Yankee Fork. The Sawtooth Fish Hatchery adult trap near the headwaters of the Salmon River is used to enumerate the escapement of natural steelhead upstream of the hatchery facility.

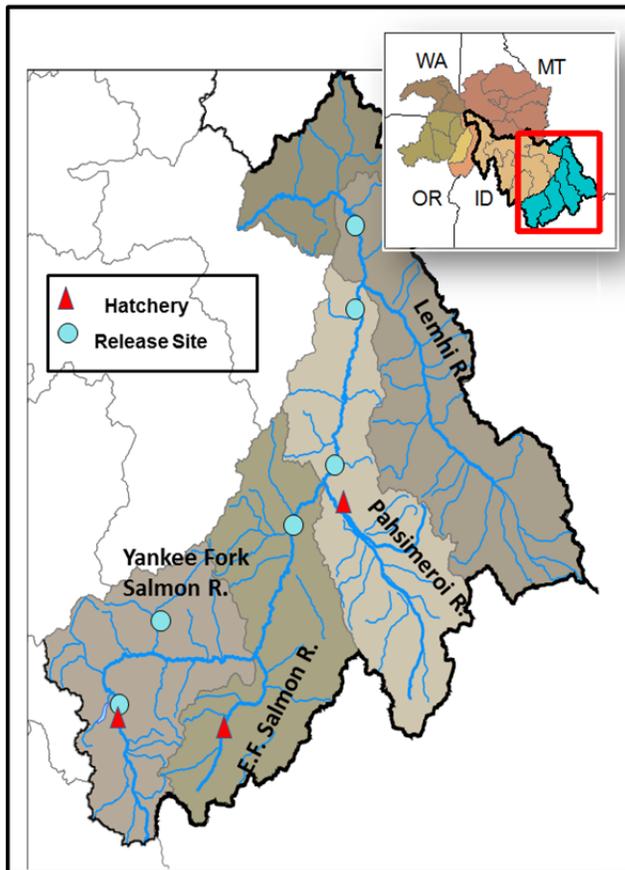


Figure 4. Upper Salmon River hatchery steelhead release locations

Upper Salmon River A-Run Component

The A-run hatchery program in the upper Salmon River that is part of the LSRCP program utilizes hatchery broodstock from both Pahsimeroi and Sawtooth fish hatcheries for a total release of 1.58 million smolts (Table 2). Historically, release sites have been distributed from the North Fork Salmon River to the Sawtooth Fish Hatchery with as many as ten release sites annually. More recently, the release locations have been consolidated to six sites. These releases include 750,000 at Sawtooth Fish Hatchery, 440,000 in the Yankee Fork Salmon River, and 390,000 across four locations in the mainstem Salmon River downstream of the East Fork Salmon River (Figure 4).

Smolts released in the Yankee Fork Salmon River are part of the 2008-2017 US v. OR Management Agreement and represent a cooperative effort between the IDFG and the Shoshone-Bannock Tribe (SBT). Previously this production had been released into other tributaries of the upper Salmon River including Slate Cr., Valley Cr., and the Lemhi River. In 2010, releases from these tributaries were consolidated into the Yankee Fork Salmon River. The lack of adequate trapping facilities in the Yankee Fork has prevented the collection of local broodstock and the monitoring of escapement back to the Yankee Fork. A more recent effort to develop trapping facilities in the Yankee Fork has prompted managers to reconsider how the Yankee Fork is managed. Future management of steelhead in the

Yankee Fork Salmon River is discussed in more detail in the description of the Upper Salmon B-run component below.

In addition to the 1.58M A-run smolts released as part of the LSRC program, 830,000 A-run hatchery smolts are released from Pahsimeroi Fish hatchery as part of the IPC hatchery mitigation (Table 2).

Upper Salmon B-Run Component

Wild populations of steelhead in the Middle Fork Salmon and South Fork Salmon rivers are classified as B-run. Both the Middle Fork and South Fork Salmon rivers are managed for wild populations and no sport harvest opportunity is available. However, it is the desire of managers to provide in-kind harvest opportunity for B-run steelhead in the Salmon River. In the late 1990s, an increased effort to build a locally adapted broodstock of Salmon River B-run hatchery steelhead was initiated. Since then it has been observed that locally adapted adults return at a significantly higher rate compared to first generation releases from Dworshak National Fish Hatchery. Even with higher return rates of the locally adapted fish, the lack of an adequate trapping facility has continually hampered the ability of managers to perpetuate and expand a locally adapted B-run broodstock in the Salmon River. As an interim measure, the locally adapted B-run broodstock was transferred to Pahsimeroi Fish Hatchery in 2009. Managers felt that this would provide the best short term solution by providing an adequate trapping facility. In the spring of 2010, approximately 120,000 B-run smolts were released at the Pahsimeroi Fish hatchery. Smolts were released with their adipose fins intact and all were tagged with coded wire tags (CWTs). This will allow the fish to be differentiated from the Pahsimeroi A-run returns and also allow them to bypass all mark selective fisheries. Returns in 2013 at Pahsimeroi Fish Hatchery from that first smolt release in 2010 are expected to produce at least 500,000 smolts. This would be a substantial increase of smolts compared to all previous years of the B-run program.

Plans initiated by the SBT to develop a permanent adult trapping infrastructure in the Yankee Fork Salmon River are currently underway. It is the intent of managers to transfer the Salmon River B-run broodstock program to the Yankee Fork Salmon River. This will provide an adequate adult collection facility necessary to expand the program. Expansion of the program will allow managers to phase out the use of DNFH broodstock in the Salmon River. As this program develops, managers also intend to replace the DNFH B-run smolt releases in the Little Salmon River with the locally adapted Salmon River B-run stock. The A-run production that is currently located in the Yankee Fork will be incorporated into existing onsite releases at Sawtooth Fish Hatchery.

East Fork Salmon River Component

The hatchery steelhead program in the East Fork Salmon River (EFSR) represents the only integrated hatchery steelhead program operated by IDFG. In 2001, an effort was initiated to develop a small conservation program in the EFSR with the intent to use a hatchery program to increase the number of natural adults in the EFSR. A permanent trapping facility exists in the East Fork Salmon River but is located approximately 18 miles upstream of the mouth and also upstream of much of the spawning and rearing habitat in the EFSR. This severely constrains our ability to manage the hatchery fraction on the

spawning grounds and to evaluate the production and productivity of the integrated program in the EFSR. In the 2008 FCRPS Biological Opinion, RPA #42 identified the need to develop the necessary infrastructure to manage the program in the EFSR. Additionally, independent regional hatchery reviews conducted by the US Fish and Wildlife Service Hatchery Review Team (HRT) (USFWS 2011) and by the Hatchery Scientific Review Group (HSRG) of the congressionally mandated Pacific Northwest Hatchery Reform Project (HSRG 2009). Both reviews indicated that developing adequate trapping facilities near the mouth of the EFSR is required to properly manage the integrated program.

Current production objectives in the EFSR include releasing 170,000 smolts immediately below the trapping facility. In the past few years, the number of hatchery returns to the East Fork trap has vastly outnumbered the natural-origin returns (Figure 5). Based on this observation, it is presumed that a significant proportion of fish spawning naturally below the trap are also of hatchery-origin. Because the majority of fish spawning both naturally and in the hatchery are hatchery-origin, the proportional natural influence (PNI) in the EFSR is low. To decrease the amount of influence the hatchery program has in the EFSR, managers have initiated changes to the hatchery program. Beginning in brood year 2013, the hatchery production will be reduced to a 60,000 smolt target with the broodstock consisting of 100% natural-origin adults. If insufficient natural-origin adults are available to produce 60,000 smolts (approx. 15 pairs) a minimum of 40,000 smolts will be produced including the use of hatchery-origin adults if necessary. When hatchery-origin adults return to the EFSR, there will be no restriction on the numbers released to spawn naturally. Managers feel that this strategy will provide the best opportunity to both maintain at least a minimum number of returning adults to the EFSR to perpetuate the hatchery broodstock and still maintain some naturally produced fish spawning in the natural environment.

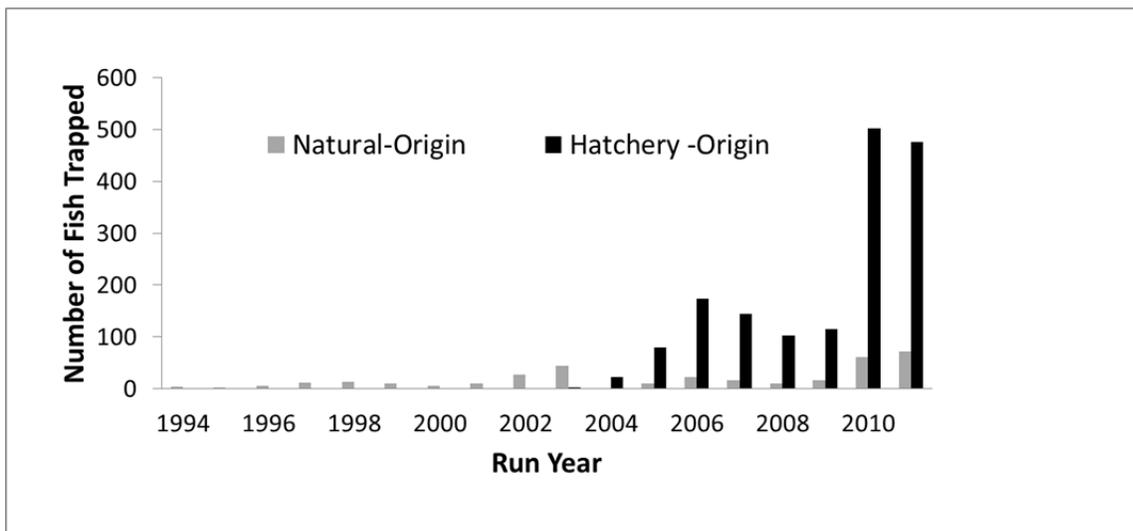


Figure 5. Hatchery- and natural-origin steelhead trapped at the East Fork Salmon River adult fish trap 1994-2011.

Hatchery Production and Survival

The following section describes the production and survival metrics associated with the hatchery program and compares the observed performance with the anticipated program mitigation benefits. Information includes in-hatchery and post release survival and contribution to fisheries for the combined LSRCP steelhead mitigation program in the Salmon River. Metrics are summarized for the combined production at each of the Magic Valley and Hagerman National fish hatcheries.

With few exceptions, egg to release survival rates for both hatcheries have remained consistently high over the time series and have not limited the ability of either hatchery facility to reach production targets (Figure 6).

Magic Valley Fish Hatchery consistently met smolt release targets through 2004 (Figure 7). Declines in spring water since then has limited the ability of the program to meet the smolt release target of 1.75 million. Currently the maximum rearing capacity is 1.54 million full term smolts at 4.5 fish per pound. Hagerman National Fish Hatchery has consistently failed to meet the release target of 1.7 million full term smolts and the failure is attributed to reduced spring flows (Figure 7). Managers are looking into alternatives to increase smolt capacity at the hatcheries given the limited water supply.

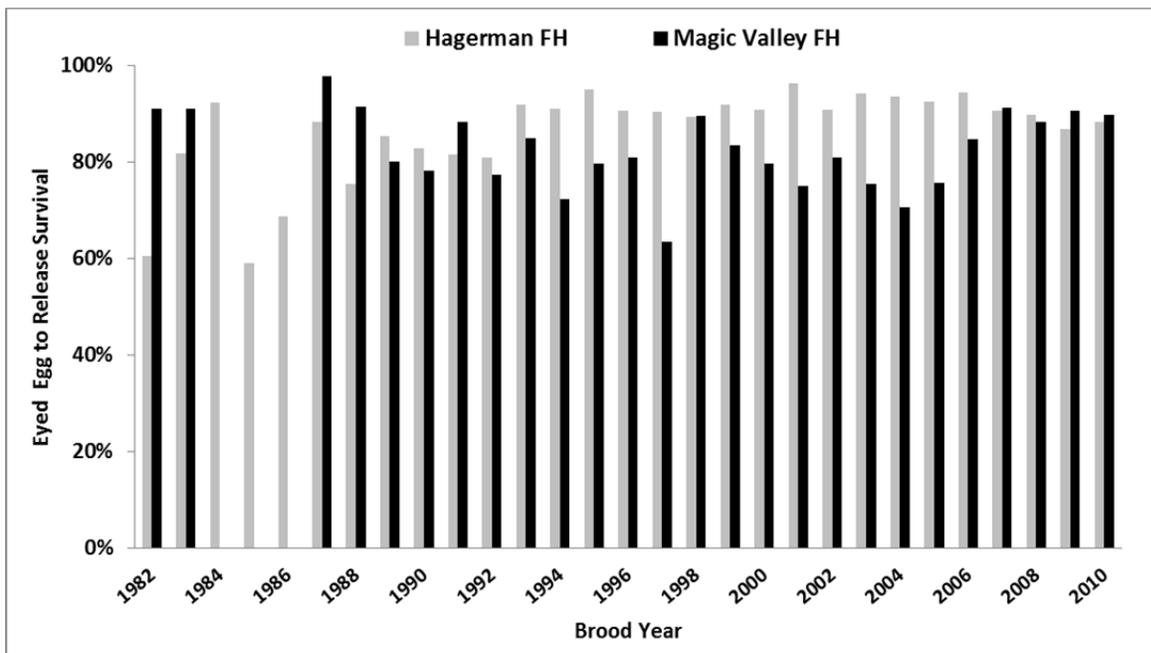


Figure 6. Eyed egg to release survival rates for steelhead reared at Magic Valley Fish Hatchery and Hagerman National Fish Hatchery.

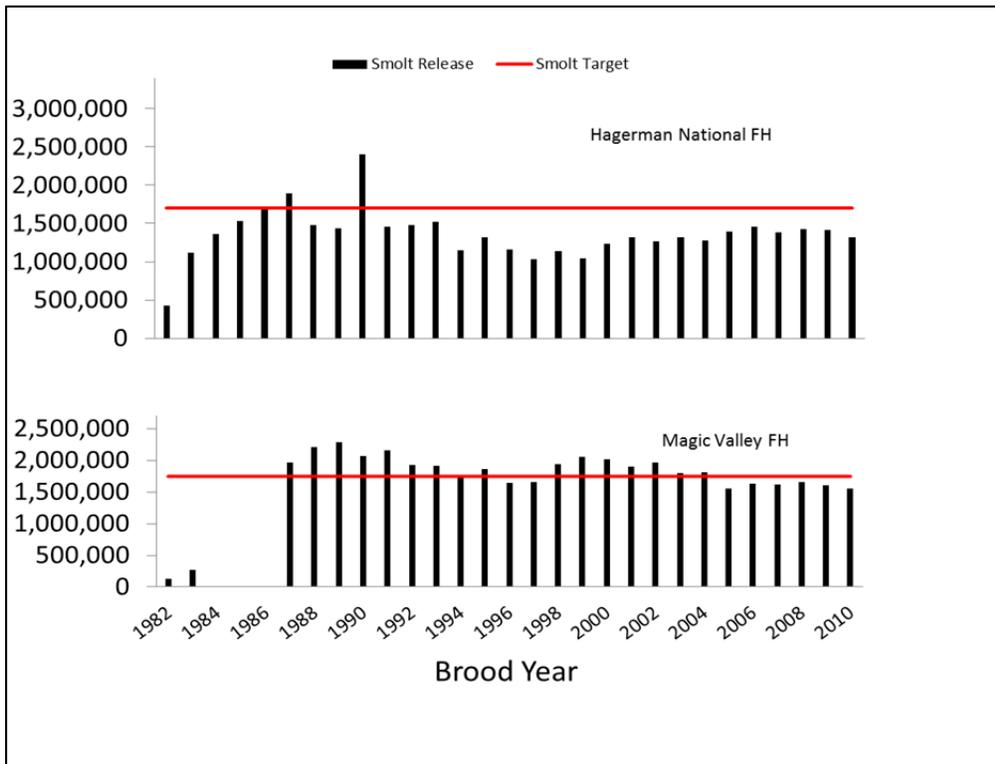


Figure 7. Number of yearling steelhead smolts released from Hagerman National Fish Hatchery and Magic Valley Fish Hatchery 1982-2010.

Estimated survivals of smolts from release sites to Lower Granite Dam are estimated using PIT tagged smolts. For migration years 1993-2011 estimated survival rates have remained stable and have averaged 73.7% and 73.4% for MVFH and HNFH respectively (Figure 8). While there really is not a benchmark or goal for juvenile survival to Lower Granite Dam for hatchery steelhead, survival rates observed from MVFH and HNFH are comparable to other facilities in the Snake River basin.

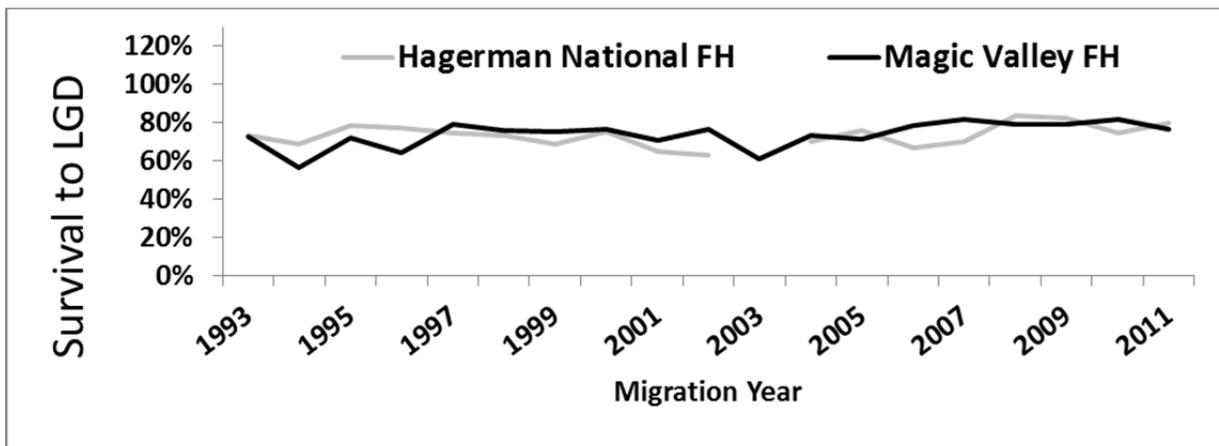


Figure 8. Estimated steelhead smolt survival from release site to Lower Granite Dam from Magic Valley and Hagerman National fish hatcheries 1993-2011.

The number of total adults produced annually from each hatchery is estimated by summing hatchery rack returns, harvest estimates, and the fish recovered as strays. As described earlier in this document, the total combined adult mitigation for the LSRCP Salmon River program is 75,800 adults produced annually (34,980 from MVFH and 40,800 from HNFH). Since 1989, the average annual number of adults produced at MVFH and HNFH is 17,470 (range: 4,600-40,100) and 16,022 (range: 2,960-50,590) respectively (Figure 9). This represents approximately 50% and 40% of the adult goals respectively. Over the history of the program, the total mitigation goal has been achieved in three years at MVFH and two years at HNFH. Despite the fact that the total goal has only been achieved a few times, this program has helped to maintain robust fisheries every year.

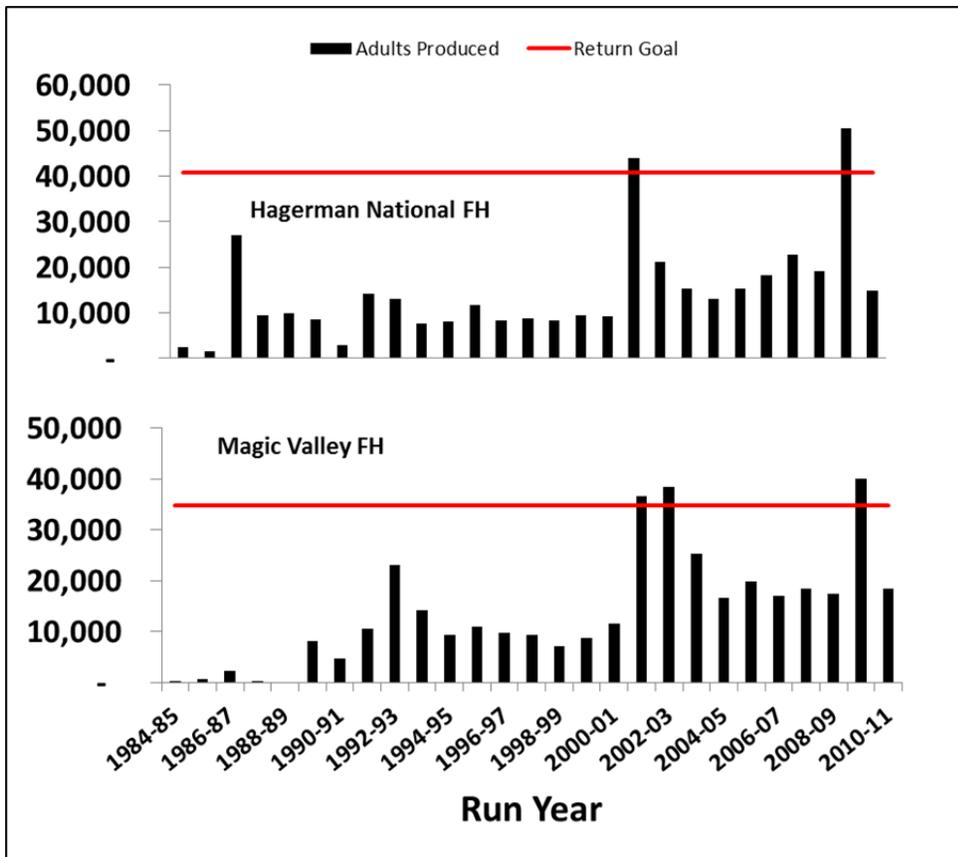


Figure 9. Total hatchery steelhead produced from Magic Valley and Hagerman National fish hatcheries 1985-2011.

Assumptions that were initially used to size the LSRCP hatchery programs included smolt to adult survival (SAS) rates of 2.0% and 2.4% necessary to achieve adult mitigation objectives for MVFH and HNFH respectively). For brood years 1982-2006 average SAS rates were 0.95% (range: 0.27-2.56%) and 1.19% (range: 0.27-4.98%) for MVFH and HNFH respectively (Figure 10).

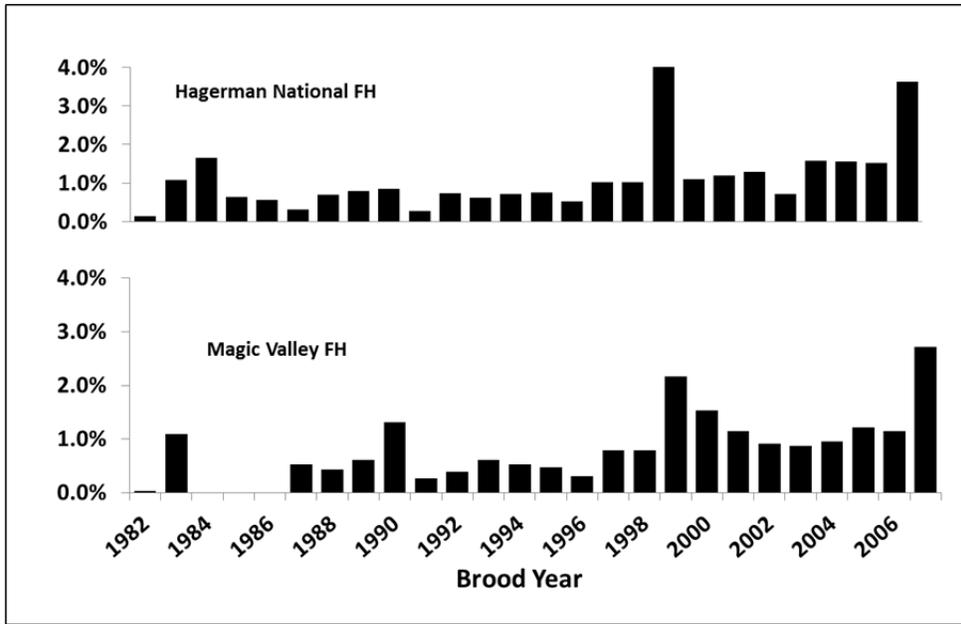


Figure 10. Estimated smolt to adult survival (SAS) rates for hatchery steelhead produced at Magic Valley and Hagerman National fish hatcheries for brood years 1982-2007

Stray Rates

Adult steelhead recovered (fisheries, hatchery traps, spawning grounds etc.) anywhere outside of the direct path to the release location are considered strays. It is possible that fish harvested outside of the direct path to the release site during the summer and fall months may have ended up back on the direct path had they not been harvested but there is not a good method to estimate this parameter. It should also be noted that these stray rate estimates are based strictly on fish that are recovered as strays in fisheries and natural spawning areas where sampling programs are in place. Because not all fisheries and natural spawning populations are sampled, reported stray rates are likely underestimates. IDFG has historically used the Left Ventral (LV) fin clip as a flag for the presence of CWT in steelhead but that clip was discontinued in brood year 2002 for A-run steelhead and in brood year 2006 for B-run steelhead. Any current recovery programs that are restricted to visual scanning for the presence of CWT will miss the CWT tagged fish and the stray rate will be underestimated. For brood years 1982-2007 estimated stray rates averaged 4.3% (range: 0-19%) and 3.5% (range: 0.1-15%) for MVFH and HNFH respectively. The majority of fish recovered as strays from MVFH and HNFH were recovered upstream of Lower Granite Dam (65% and 64% respectively). Many of the recoveries upstream of Lower Granite dam were in fisheries located immediately upstream of the direct path to the release location but based on the strict definition were included in stray rate estimation.

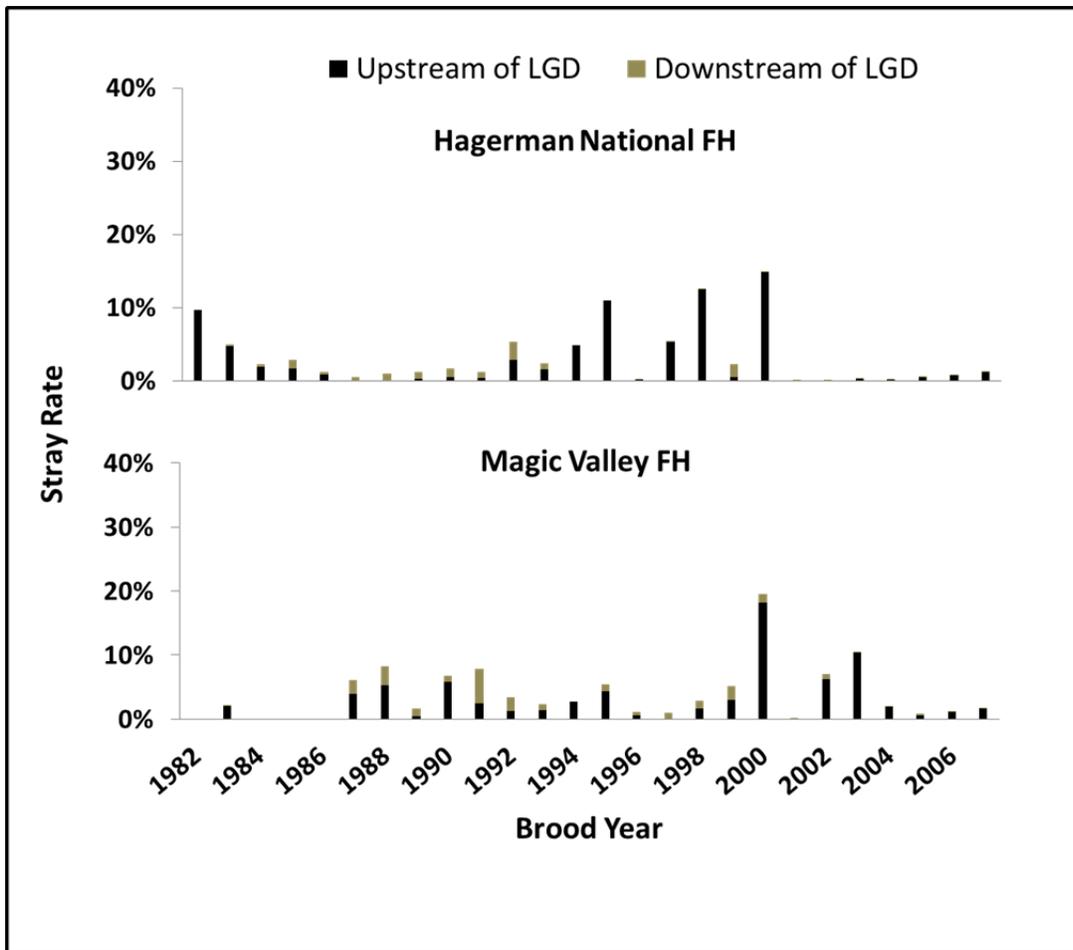


Figure 11. Estimated stray rates of hatchery steelhead produced at Magic Valley and Hagerman National fish hatcheries for brood years 1982-2007. Estimated stray rates are differentiated for the areas upstream and downstream of Lower Granite Dam.

Contribution to Harvest

Harvest Downstream of Lower Granite Dam

As previously mentioned, the primary focus of the LSRCP hatchery program in the Salmon River is harvest mitigation. Since the inception of the program, both MVFH and HNFH have produced numbers of adult steelhead sufficient to maintain robust sport and tribal fisheries in Idaho and have also supported fisheries downstream of the project area. While the distribution of harvest benefits has changed over the program history, the contribution to overall adult production has remained relatively stable through time with a few notable extremes (Figure 9). Prior to 1999, estimated harvest rates in areas downstream the project area ranged from 16-53%. Since 1999, the estimated harvest rates in fisheries downstream of the project area have ranged from 3-8% percent. This reduction in harvest rate is primarily related to changes in harvest management in the Columbia River since the mid-1990s. However, when these harvest rate estimates are compared with the cumulative harvest information for

A-run index stocks reported by the US v. OR Technical Advisory Committee (TAC) for the Columbia River downstream from McNary Dam, it appears that the harvest rates based on CWT expansions for MVFH and HNFH underestimate the actual harvest assuming that the MVFH and HNFH releases are harvested at a similar rate as the aggregate A-run index stocks used by TAC (Figure 12).

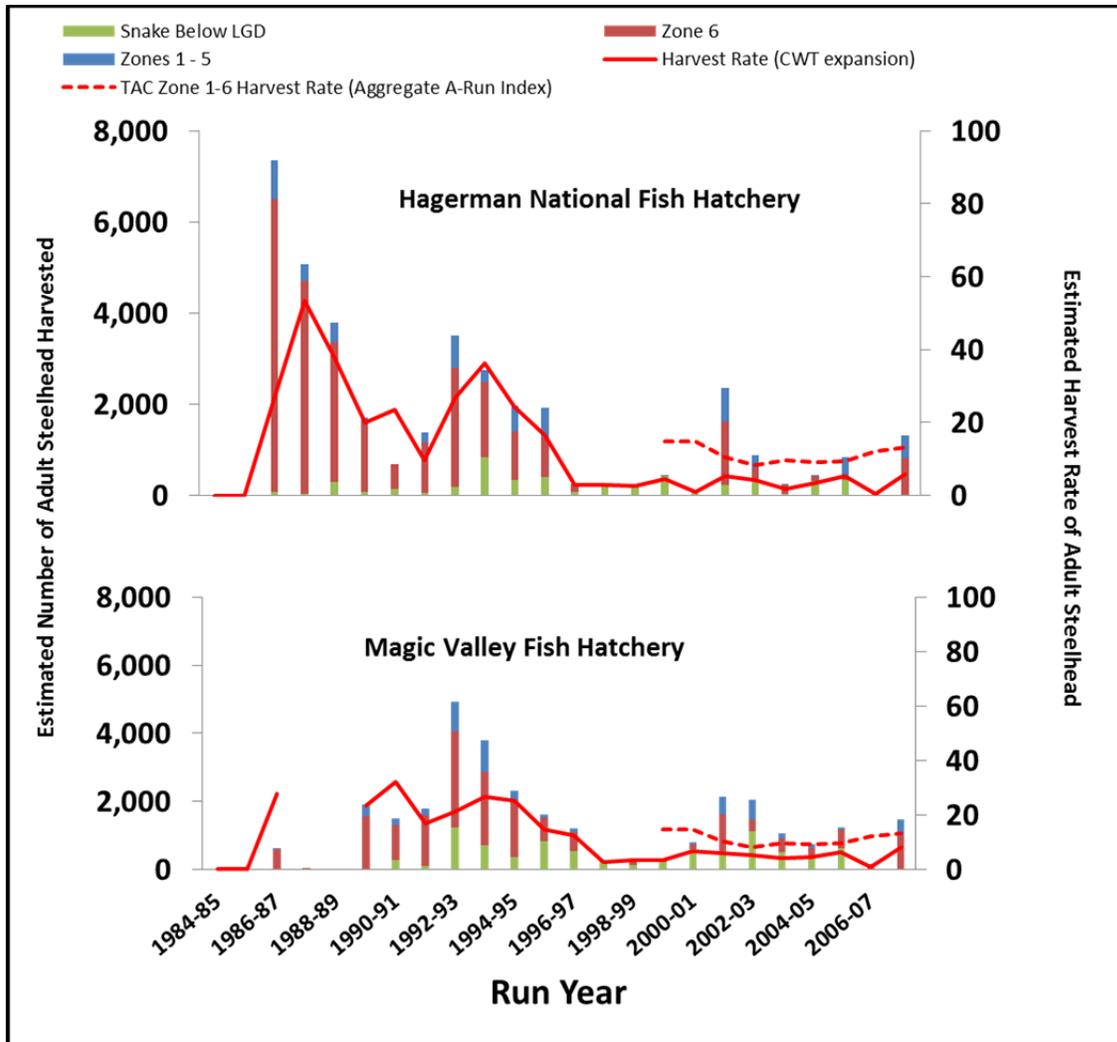


Figure 12. Estimated harvest rates of hatchery steelhead in the Columbia and Snake rivers downstream of Lower Granite Dam for return years 1985-2008. All fish were produced at Magic Valley and Hagerman National fish hatcheries.

If the MVFH and HNFH releases are actually harvested at a similar rate, there are a couple of possible explanations for why the harvest rates reported for these stocks are underestimated. First, there could be an insufficient number of fish marked with CWTs to accurately represent the stock composition of the harvest. Over the history of the MVFH and HNFH programs, the major release components from each hatchery have been tagged with CWT (usually 60-100K CWTs). However, in some years, some or all of the offsite releases were not marked with CWT. In these situations, the CW tagged groups were used as surrogates to represent the untagged releases. If the untagged release groups survive at a different

rate, or behave differently in the fisheries, a harvest rate estimate based on data from a tagged surrogate group would be biased. Given that the tagged and untagged release groups are the same stocks reared at the same facility, it is unlikely that a significant bias would result. A second possible explanation is that escapement estimates at LGD are overestimated for MVFH and HNFH. An overestimate of the escapement would artificially decrease the harvest rate downstream of LGD. To examine this, we have taken a preliminary look at the escapement data and summarized the total estimated escapement to Lower Granite Dam across all programs (Oregon, Idaho and Washington) located upstream of Lower Granite Dam and compared those totals to the window counts at Lower Granite Dam (Figure 13). For every year, the summed escapement estimates are less than the total window counts for hatchery fish. Given this, it is unlikely that we are overestimating the escapement at Lower Granite Dam. A third possible explanation is that CWTs from MVFH and HNFH are not being sampled representatively in the observed catch. We have no information to indicate this is happening but we are going to work with agency staff from Oregon, Washington and CRITFC to try and determine if this issue exists. We are also going to do a more thorough review of the historic CWT recovery data to try and resolve this discrepancy.

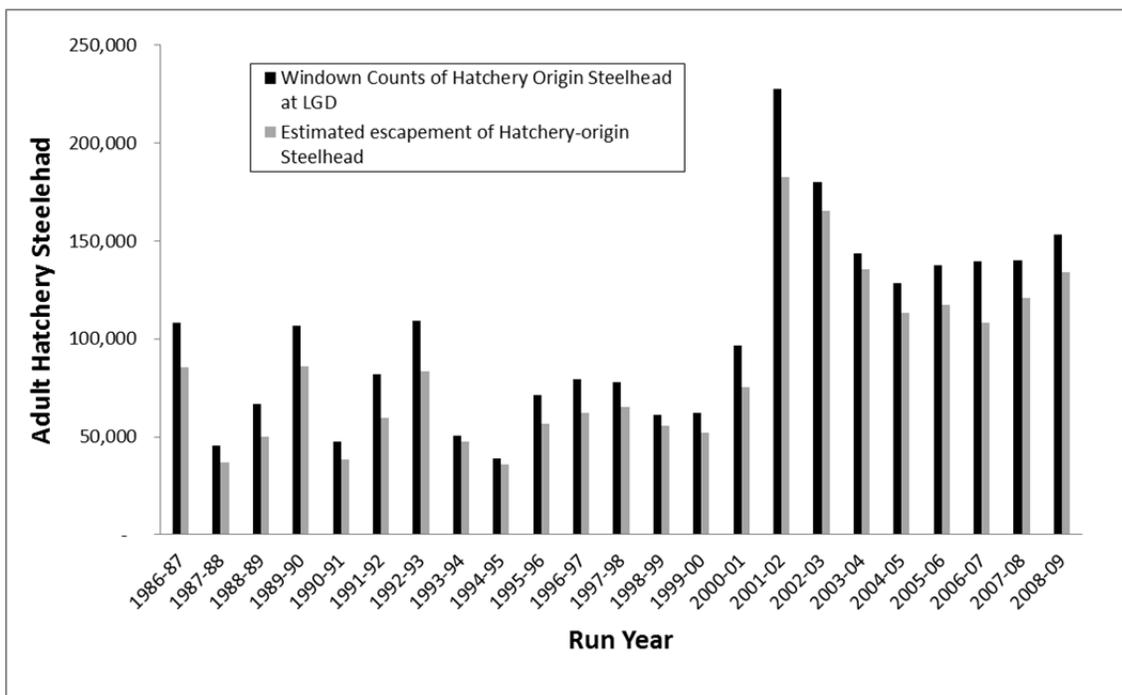


Figure 13. Comparison of the total estimated escapement of hatchery steelhead produced upstream of Lower Granite Dam to the window counts at Lower Granite Dam 1986-2009

The IDFG is in the process of shifting the steelhead marking program to a genetic technology whereby essentially all progeny are tagged via Parental Based Tagging (PBT). This is accomplished by taking tissue samples from all adults that contribute to hatchery broodstocks. When any of their progeny are sampled

(as juveniles or adults), the parents can be identified thus revealing the hatchery, stock, age, gender, and release site. Beginning in 2011, with cooperation from CRITFC and WDFW, tissue samples from the observed harvest both above and below Bonneville Dam are being collected and analyzed to estimate the harvest contribution of Snake River steelhead in the Zones 1-6 fisheries. We will compare the results of the PBT stock composition analysis alongside that of the CWT analysis to help identify if the CWT data is biased.

Harvest Upstream of Lower Granite Dam

Over the history of the LSRCP program, Idaho has maintained consistent and robust steelhead fisheries in the Snake and Salmon rivers providing anglers with abundant opportunity in both in time and space. The total number of adult steelhead from MVFH and HNFH harvested upstream of Lower Granite Dam annually between 1987 and 2011 averaged 16,628 (range: 2,677-52,043) (Figure 14). More recently (since 2000) the number of fish harvested annually above Lower Granite Dam has averaged 24,974 (range: 13,418-52,043%). Harvest rates over these two periods averaged 68% (range: 41-85%) and 66% (range: 59-77%) respectively.

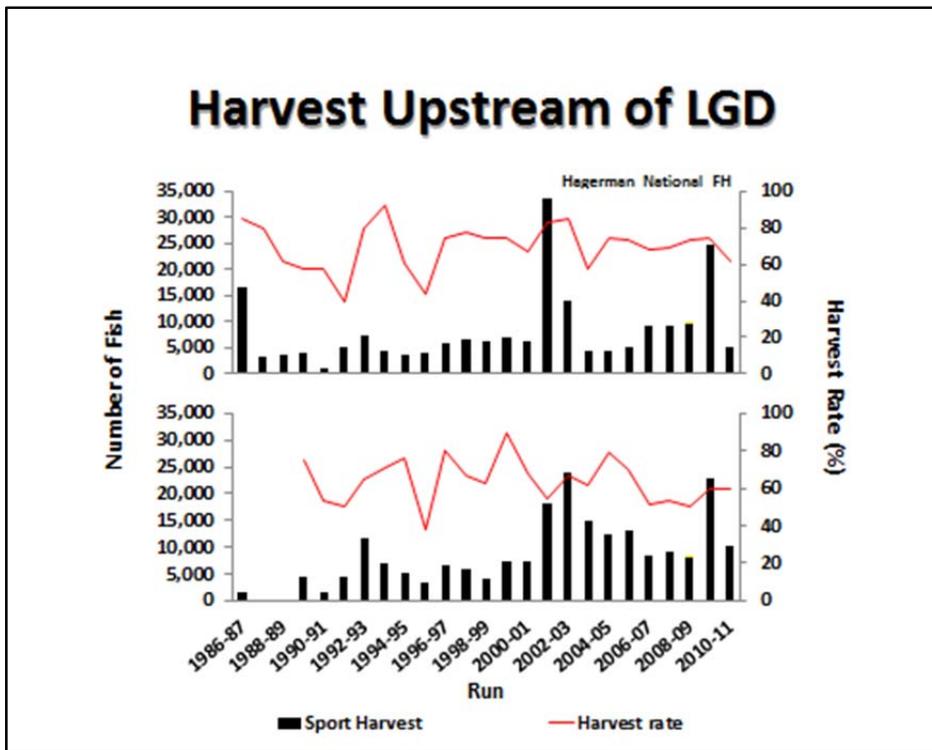


Figure 14. Estimated number of hatchery steelhead harvested upstream of Lower Granite Dam 1986-2011. All fish were produced from Magic Valley and Hagerman National fish hatcheries.

There are currently 410 river miles open to steelhead fishing in the Salmon and Little Salmon rivers combined and a total of 289 days open to steelhead fishing in some river zones with a minimum of 260

days open in all river zones (Figure 15). Total annual angler effort in the Salmon River since 1984 has averaged 219,200 angler days (range: 136,000-382,000 days) (Figure 14). This fishery provides unique opportunity for anglers to spread out and achieve the angling experience they desire in a variety of riverine habitats and conditions throughout the majority of the year.

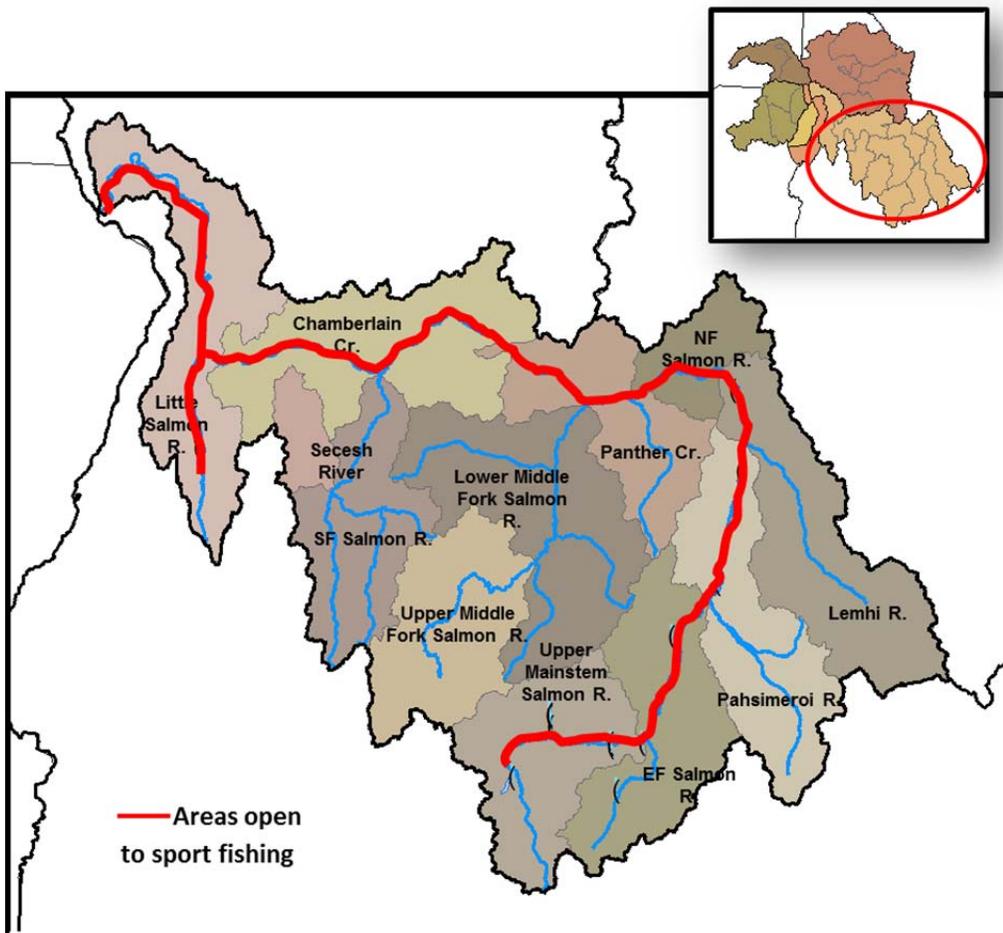


Figure 15. Hatchery steelhead fishing boundaries in the Salmon River, ID.

When comparing harvest and angler effort over the program time series in the Salmon River including the period prior to hatchery mitigation, the current harvest and angler effort estimates are considerably higher than the pre-mitigation period. It is important to note that the catch and effort displayed in Figure 16 represents the combined harvest and effort information for both the LSRCP and IPC programs. To show the relationship with harvest and effort it was necessary to combine them since effort cannot be attributed to a single program due to the significant spatial and temporal overlap of the programs (LSRCP and IPC). The

primary purpose of the figure is to convey that the hatchery mitigation program is maintaining sport fisheries relative to the pre-mitigation period.

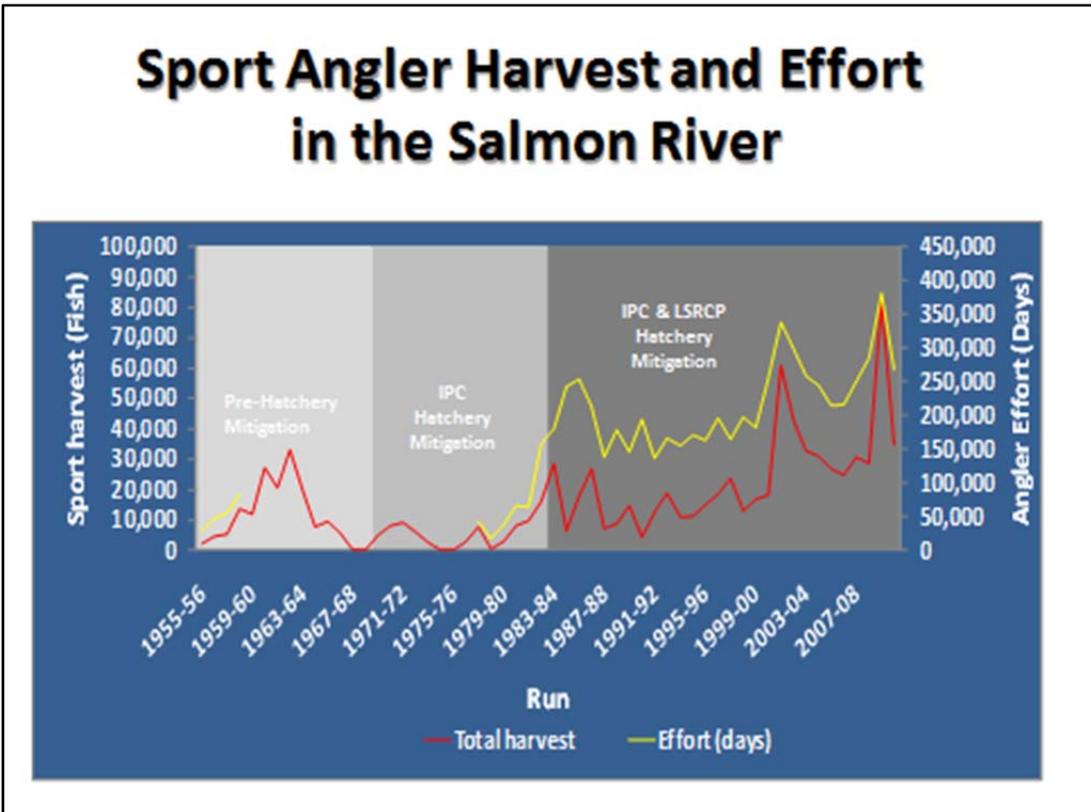


Figure 16. Estimated harvest and angler effort for the hatchery steelhead fisheries in the Salmon and Little Salmon rivers 1956-2010.

Summary and Moving Forward

Since the inception of the LSRCP hatchery mitigation program in Idaho, IDFG has prioritized harvest mitigation as the primary function of the hatchery program and has focused efforts to maximize SARs, provide anglers with abundant harvest opportunity, and to meet adult mitigation objectives. During this period, hatchery practices have been refined and with few exceptions, broodstock collection and in-hatchery survival has not limited the ability of managers to meet smolt production objectives. Hatchery adult returns from HNFH and MVFH have consistently provided robust fisheries upstream of the project area and have also contributed to fisheries downstream of the project area. While the total adult mitigation objective has only been reached in a few years, MVFH and HNFH have annually produced on average 50% and 40% to the total mitigation goal respectively since 1989.

The Salmon River represents a significant portion of the habitat in the Snake River that historically produced wild steelhead. Likewise, the Salmon River hatchery steelhead program is the largest hatchery steelhead program in the Snake River. In addition to the LSRCP hatchery mitigation, approximately 70% of the IPC hatchery mitigation for the Hells Canyon hydroelectric complex is also operated within the Salmon River in the same general proximity to the LSRCP program. Managers realize that operating a

hatchery mitigation program this large is not without some risk to natural populations. Since the inception of hatchery mitigation efforts in the Salmon River, IDFG has maintained a management framework that emphasizes reducing interactions between hatchery-origin and natural-origin fish by confining hatchery releases to areas that managers feel will have the least impact on natural populations. Within the Salmon River sub-basin, there are no hatchery steelhead releases in the South Fork Salmon River, Middle Fork Salmon River, North Fork Salmon River, or in the mainstem Salmon River downstream of the North Fork Salmon River.

Over the history of the program, IDFG has been adaptively managing the hatchery program to both increase adult returns and to reduce impacts to natural populations. Changes have included consolidating release sites to areas away from natural populations and emphasizing the use of locally adapted broodstocks. In an effort to provide in-kind mitigation, managers are committed to maintaining both A-Run and B-run hatchery stocks in the Salmon River mitigation program. This includes a recently expanded effort to increase the development of a locally adapted B-run hatchery stock in the Salmon River. This change is expected to increase the survival rate, provide more opportunity to harvest B-run steelhead, and allow managers to phase out the use of the Dworshak National Fish Hatchery stock in the Salmon River.

While IDFG has prioritized the use of the hatchery program to mitigate for lost harvest opportunity, evaluating the use of hatchery supplementation to aid in the maintenance and recovery of natural populations has also been prioritized. A small hatchery program within the EFSR is operated to evaluate the use of an integrated broodstock to supplement the natural population. Current trapping infrastructure in the EFSR is insufficient to properly manage an integrated program due to its location high up in the drainage. The RPA #42 listed in the 2008 FCRPS Biological Opinion identified the need for infrastructure development to operate this program. Additionally, two independent regional hatchery reviews (HRT and HSRG) both recommended developing adult trapping infrastructure near the mouth of the EFSR to properly operate the integrated program.

The IDFG views the LSRCP hatchery steelhead mitigation program as a success story in that it has made significant progress towards achieving the targeted management objectives. This program has provided consistent and robust steelhead fisheries throughout the program history and has maintained the ability of managers to provide abundant angling and harvest opportunity over a vast landscape during the majority of each year. These fisheries have not only provided significant economic impacts to the region and state, but have also helped to maintain a connection between citizens and our natural resources.

The IDFG is fully committed to maintain and restore ESA listed populations of steelhead. At the same time we are also committed to continue the operation of the hatchery mitigation program. To address this, we have developed a management framework that incorporates both objectives. Hatchery and Genetic Management Plans (HGMPs) have been developed to describe the management goals, program plans, monitoring and evaluation plans, and plans for addressing risks associated with each of the programs. We view these plans as guidance documents and understand the need to remain flexible as new information becomes available to help guide and improve the programs in such a way to better achieve the stated IDFG management objectives.

Acknowledgements

The list of people directly involved with the Salmon River steelhead program is extensive. We would like to begin by extending our sincere appreciation to the many hatchery staffs that are involved with this program. They include: Magic Valley Fish Hatchery, Hagerman National Fish Hatchery, Sawtooth Fish Hatchery, Clearwater Fish Hatchery, Pahsimeroi Fish Hatchery and Dworshak National Fish Hatchery. They all make significant contributions to the highly coordinated and successful program in the Salmon River. We would also like to thank the many cooperators in the basin including staff at the IDFG regional office in Salmon, Idaho Power Company, Pacific States Marine Fisheries Commission, IDFG harvest monitoring crews, and the staffs from the Shoshone-Bannock Tribe, the Nez Perce Tribe, and the US Fish and Wildlife Service. Lastly, we would like to thank the staff at the LSRCP office in Boise, ID for providing funding and support to maintain and improve the program.

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