**Prioritization of Snake River Instream PIT Tag Detection Systems for Operations & Maintenance**

**Version:** April 10, 2024



**Snake River Instream PIT-tag Detection Systems Prioritization Workgroup**

**Primary Contributors:** Michael W. Ackerman (NPT), Joseph Bumgarner (WDFW), Timothy Copeland (IDFG), Ethan Crawford (WDFW), Joseph W. Feldhaus (ODFW), Ryan Kinzer (NPT), Jason Vogel (NPT)

(this page intentionally left blank)

Table of Contents

[BACKGROUND 1](#_Toc163657647)

[Objectives 1](#_Toc163657648)

[GENERAL APPROACH 1](#_Toc163657649)

[Abundance 2](#_Toc163657650)

[Productivity 2](#_Toc163657651)

[Spatial Structure 2](#_Toc163657652)

[Diversity 2](#_Toc163657653)

[PRIORITIZATION FRAMEWORK 2](#_Toc163657654)

[Additional Considerations 8](#_Toc163657655)

[RESULTS 8](#_Toc163657656)

[Synopsis 8](#_Toc163657657)

[Snake River Basin Steelhead DPS 12](#_Toc163657658)

[Salmon River MPG 12](#_Toc163657659)

[Clearwater River MPG 15](#_Toc163657660)

[Imnaha River MPG 18](#_Toc163657661)

[Grande Ronde River MPG 19](#_Toc163657662)

[Hells Canyon MPG 20](#_Toc163657663)

[Lower Snake MPG 21](#_Toc163657664)

[Snake River Spring/Summer-run Chinook Salmon ESU 22](#_Toc163657665)

[Upper Salmon River MPG 22](#_Toc163657666)

[Middle Fork Salmon River MPG 24](#_Toc163657667)

[South Fork Salmon River MPG 26](#_Toc163657668)

[Grande Ronde / Imnaha River MPG 27](#_Toc163657669)

[Lower Snake River MPG 29](#_Toc163657670)

[DISCUSSION 30](#_Toc163657671)

[LITERATURE CITED 31](#_Toc163657672)

[APPENDIX A. Recovery Scenarios for Snake River Populations 32](#_Toc163657673)

[APPENDIX B. Coefficients of Variation for IPTDS-Based Abundance Estimates 38](#_Toc163657674)

**Suggested Citation:**

Snake River Instream PIT-tag Detection Systems Prioritization Workgroup (SR IPTDS PW). 2024. Prioritization of Snake River Instream PIT Tag Detection Systems for Operations and Maintenance. Report to the Bonneville Power Administration. BPA Project # 2010-057-00.

# BACKGROUND

Numerous Instream PIT Tag Detection Systems (IPTDS) have been installed throughout the Snake, upper Columbia, and John Day River basins to support habitat action effectiveness and status and trends monitoring initiatives developed under the Integrated Status and Effectiveness Monitoring Project (ISEMP: BPA project number 2013-007-00). However, when ISEMP was largely defunded in 2017, comanagers identified a subset of IPTDS for which continued operation was of high priority, including in the Snake River basin. The Integrated IPTDS Operations and Maintenance (O&M) project (BPA project number 2018-002-00) was created to assume O&M responsibilities for a subset of IPTDS with continued status and trends monitoring and management utility. However, the number and location of IPTDS on the landscape has been somewhat dynamic and each may be operated for more than one and/or differing purposes. Related, it has not always been clear which IPTDS (i.e., which management, monitoring, or research objectives) should be prioritized and managed under the IPTDS O&M project. Therefore, a small group of representatives from the fisheries management agencies was convened to address this issue within the Snake River basin.

## Objectives

Our goal is to provide clarity on research, monitoring, and evaluation (RM&E) objectives and to provide recommendations on the continued funding of O&M for IPTDS throughout the Snake River basin, to be continued under Bonneville Power Administration (BPA) project number 2018-002-00 (Project), currently managed by Biomark, Inc. Here, the primary goal for prioritization and selection of IPTDS is to obtain status and trends information for spring/summer run Chinook salmon and summer-run steelhead populations in the basin, including high-precision monitoring in at least one population per major population group (MPG) following the recommendations of the Anadromous Salmonid Monitoring Strategy (ASMS; CBCAMW 2010). We recognize the importance that all individual IPTDS have and their ability to answer specific fish monitoring and research questions. However, we were tasked with developing a prioritization process to objectively rank the IPTDS sites required to obtain abundance and life history high-level indicators[[1]](#footnote-1) (HLI; PNAMP 2009) efficiently and reliably, and to recommend them for continued or improved O&M through project 2018-002-00. Ultimately, our aim is to provide a transparent framework to identify the following recommendations and/or outcomes for IPTDS:

1. Continued funding of O&M for IPTDS currently managed under the Project,
2. Transferring existing sites to the IPTDS O&M Project whose operation support Project objectives,
3. Moving existing sites to better support ICTRT population monitoring,
4. Propose new IPTDS to address data gaps or to increase cost-savings,
5. Upgrades to existing sites to improve site reliability or detection probabilities,
6. Decommissioning or removal of sites, or alternatively, allow sites currently managed under the Project to be transferred to other projects whose objectives they support.

# GENERAL APPROACH

Four general parameters form the key to evaluating a population’s viability status: abundance, productivity, spatial structure, and diversity (McElhany et al. 2000). The ASMS recommends the following general guidelines, *among others*, to assess these Viable Salmonid Population (VSP) criteria (CBCAMW 2010):

## Abundance

* Annual adult status and trend data should be collected at high intensity monitoring (precision) for *at least* one population per life history type (spring versus summer run) per MPG. This adult monitoring should be invested in populations with high intensity juvenile and smolt abundance monitoring.
* Annual adult status and trend data should be collected at lower intensity monitoring for every population within an MPG.
* Adult monitoring should report abundance and precision (confidence intervals [CI’s]) on a yearly basis in a manner that will allow abundance (and certainty levels) to be aggregated at larger spatial scales (e.g., MPG or ESU/DPS).

## Productivity

* Annual estimates of adult:adult productivity[[2]](#footnote-2) and CI’s for each population.
* Annual estimates of juvenile and smolt migrants and CI’s for at least one population per MPG. Juvenile and smolt monitoring should be done in populations with high intensity adult monitoring to calculate smolts per female (or smolts per spawner).
* For VSP analysis the adult:adult productivity estimate is a higher priority than the adult:juvenile (smolt) productivity estimate.

## Spatial Structure

* Periodic surveys of adult and juvenile distribution at the population and/or MPG scale to allow an assessment of the spatial structure and changes.

## Diversity

* Periodic sampling of populations for genetic diversity. Sample wild populations on a rotating five-year basis to maintain genetic baselines for genetic stock identification and to evaluate genetic population structure and diversity.
* Periodic monitoring of population phenotypic diversity (e.g., juvenile outmigration timing, adult run timing, spawn timing, age distribution, age at maturity, fecundity, sex ratio, size, and weight).

IPTDS throughout the Snake River basin can be used to monitor adult abundance and productivity directly, as well as spatial structure and diversity, indirectly (supported by genetic and age data collected at Lower Granite Dam or elsewhere). As such, we considered these ASMS guidelines within the following prioritization framework.

Continue here…

# PRIORITIZATION FRAMEWORK

1. First, we evaluated existing status and trends monitoring activities within each Snake River spring/summer Chinook salmon and steelhead population to determine areas with current insufficient monitoring (i.e., data gaps), or with low- or high-precision monitoring (see blue boxes in Figure 1). Descriptions of each are as follows:
   1. **Data Gap:** Population lacks low-precision or high-precision monitoring activities to calculate HLIs, i.e., the population lacks adult abundance estimates with precision in most years.
   2. **Low-precision Monitoring:** Population includes monitoring activities that lack information necessary to calculate HLI precision, the 5-year average coefficient of variation (CV) is > 15%, or the monitoring occurs at a spatial/temporal scale that excludes some fish returning to major spawning areas within the population. Examples of low-precision monitoring include spawning ground surveys, and picket weirs or IPTDS operated upstream of some major spawning areas[[3]](#footnote-3).
   3. **High-precision Monitoring:** Population includes monitoring activities that provide the necessary information to calculate HLI precision, maintain a 5-year average CV of ≤ 15%, and occur at a spatial/temporal scale that includes all fish returning to major spawning areas within the population. Fish returning to minor spawning areas may be excluded. Examples of high-precision adult monitoring include picket weirs and IPTDS operated downstream of all spawning areas.
2. Next, depending on the current monitoring activities within each population (non, low-precision, or high-precision), additional questions were considered to determine an “outcome” (Figure 1). Questions considered whether other populations within the same MPG were monitored using high-precision monitoring, whether IPTDS was the sole monitoring method within the population, whether low-precision monitoring was an option, and/or whether redundancy in monitoring was desired or necessary. Each set of questions and answers leads to an “outcome” (Figure 1). Questions for each population given current levels of monitoring include:
   1. **Data Gap:** The ASMS suggests that low-intensity monitoring should be conducted for every population within an MPG. Thus, populations identified as a “data gap” i.e., with no monitoring, should be considered as a candidate for IPTDS monitoring and/or other low-precision monitoring methods.
   2. **Low-precision Monitoring:** For populations with current low-precision monitoring, we consider up to three questions:
      1. Does any other population within the same MPG receive high-precision monitoring?
      2. Is the population monitored using only IPTDS?
      3. Is an alternate low-precision monitoring method feasible?
   3. **High-precision Monitoring:** For populations with current high-precision monitoring, we consider up to five questions:
      1. Is the population currently monitored using IPTDS?
      2. Does any other population within the same MPG receive high-precision monitoring?
      3. Is IPTDS the only high-precision monitoring method used in the population?
      4. Is an alternate low-precision monitoring method feasible?
      5. Is redundancy of two high-precision methods necessary e.g., for method validation, fish-handling, etc.?

Depending on the “Yes/No” answers to each of these questions, there are four possible “outcomes” illustrated and described in Figure 1 and Table 1.



**Figure 1**. Flowchart used to determine monitoring needs for each Snake River spring/summer Chinook salmon and steelhead population, and whether IPTDS in each population should be considered for inclusion in BPA project 2018-002-00. Outcome colors are as follows: Red = candidate for decommissioning or removal from project 2018-002-00; yellow = further considerations needed; green = IPTDS should be operated under project 2018-002-00.

**Table 1**. Potential population-level outcomes resulting from the initial step of the prioritization framework. Red = candidate for decommissioning or removal from project 2018-002-00; yellow = further considerations needed; green = IPTDS should be operated under project 2018-002-00.

|  |  |
| --- | --- |
| **Outcome** | **Description** |
| **Consider removing IPTDS (if any) from O&M project; keep other monitoring method** | Outcome is for populations that either a) occur within an MPG in which another population is monitored using a high-precision method AND is monitored using another low-precision method, or b) is monitored using two redundant, high-precision methods including IPTDS and redundancy is not necessary. |
| **Population is candidate for IPTDS O&M project** | Outcome is for populations with currently no monitoring (i.e., data gaps) or for a population within an MPG that includes no populations with high-precision monitoring.[[4]](#footnote-4) |
| **Keep IPTDS or consider an alternative low-precision method** | Outcome is for populations that currently experience high-precision IPTDS monitoring but occur within an MPG in which two or more populations are monitored using high-precision methods. |
| **Include necessary IPTDS on O&M project** | The population should continue to be monitored using IPTDS funded under the Integrated IPTDS O&M project. Three paths in Figure 1 lead to this outcome. In general, this outcome is for populations in which current IPTDS are necessary for either low-precision or high-precision monitoring. |

1. Finally, for each extant population, we further considered which IPTDS site(s) within the population are necessary for status and trends monitoring (low- or high-precision) and recommended for inclusion in project 2018-002-00 (Figure 2). Definitions and descriptions in Table 2 are provided to aid in interpretation of Figure 2.

**Table 2.** Definitions or descriptions that may be useful for interpretation of Figure 2.

|  |  |
| --- | --- |
| Term | Definition or Description |
| Nodes | A node is made up of a single, or group of, antenna(s) that form an independent PIT-tag detection location, oftentimes an array, and can be ordered in reference to other nodes in the stream network. |
| Unbiased / Independent | IPTDS sites and/or nodes are independent if the probability of detecting a tag at one location is independent of detection at another site or node. For example, two nodes (e.g., arrays) within a short distance of each other (e.g., less than 50 meters) may not be independent if marked fish are not mixing with unmarked fish between the nodes. |
| Reliable | The site has operated continuously (or near continuously) through the adult migration period for each of the last five years for spring/summer Chinook salmon and steelhead. |



**Figure 2.** Flowchart demonstrating the decision-making process on which IPTDS(s) within a given population should be considered for inclusion in the IPTDS O&M project (BPA project 2018-002-00), and/or whether any IPTDS(s) within a population could be removed.

# Additional Considerations

In addition to the prioritization framework outlined which uses ASMS guidance (CBCAMW 2010), we also considered the role or importance of each population according to the viable MPG recovery scenarios provided by NOAA (2017; APPENDIX A. Recovery Scenarios for Snake River Populations). As an example, populations targeted for viability or high viability might be considered as a priority for high-precision monitoring over populations that are only targeted to be maintained. We also summarized for each steelhead and sp/sum Chinook salmon population the spawn years in which IPTDS-based abundance estimates were considered “valid” and the coefficients of variation around those estimates (APPENDIX B. Coefficients of Variation for IPTDS-Based Abundance Estimates), which collectively provides information on both populations where IPTDS are in operation and the reliability (Table 2) of those IPTDS.

The goal of our site prioritization framework is to make recommendations as transparent and clear as possible. However, for some MPGs, populations, and/or IPTDS sites, “gray areas” exist, and professional judgement must occasionally be made which considers population priorities, logistics, costs, site reliability, past decisions, etc. Further, some recommendations for Snake River steelhead inevitably must consider spring/summer Chinook salmon, or vice-versa, and so both species were considered during the process. However, we do recognize that greater logistical constraints historically occur for monitoring returning steelhead adults, and so in instances, some additional weight is given towards steelhead population monitoring. Considerations and recommendations for Snake River steelhead and spring/summer Chinook salmon, by MPG and population, follow.

# RESULTS

## Synopsis

After considering each IPTDS site, population, and MPG for both steelhead and spring/summer Chinook salmon, sites were each lumped into one of four categories: 1) site recommended for continued funding, 2) existing sites recommended for funding under the IPTDS O&M project, 3) proposed new sites, and 4) candidate sites for decommissioning or removal, at least from funding under the IPTDS O&M project (Table 3). A summary of recommendations is provided in Table 3 with footnotes; more detailed descriptions of considerations and recommendations are provided the in the Results that follow.

**Table 3.** Summary of recommendations for IPTDS in the Snake River basin.

| Site Code | O&M Site | Steelhead Pop ID | Chinook Pop ID | Recommendation | Notes |
| --- | --- | --- | --- | --- | --- |
| Upper Salmon | | | | | |
| VC2 | Yes | SRUMA-s | SRVAL | Continue funding | Collectively, VC2 and YFK would provide monitoring for 2 of 5 major spawning areas in SRUMA-s. Prior to YFK, CVs for IPTDS-based estimates for SRUMA-s exceeded 15%; since YFK was installed CVs have been <15% in 6 of 11 years. If transferring YFK to the project is not desired, an IPTDS in the mainstem Salmon River near Clayton could be considered. |
| YFK | No | SRUMA-s | SRYFS | Candidate to transfer to project |
| - | - | SREFS-s | SREFS | Add IPTDS | No IPTDS-based monitoring within the SREFS-s population is currently funded under the project. An IPTDS near the lower boundary of SREFS-s (downstream of Morgan Creek or near Challis, ID) along with an IPTDS near the lower boundary of SRUMA-s (near Clayton, ID), both on the Salmon River, would improve monitoring of the SREFS-s and SRPAH-s populations. If an IPTDS at the lower boundary of SRUMA-s is not feasible, a site in the lower East Fork Salmon River should be added. USI, at its current location, is not necessary for population status and trends monitoring, and could be decommissioned or moved to support proposed recommendations. |
| USE | Yes | SRPAH-s | SRLMA | Continue funding |
| USE | Yes | SRPAH-s | SRLMA | Decommission, remove, or transfer to another project |
| LLR | Yes | SRLEM-s | SRLEM | Continue funding | - |
| BHC | Yes | SRLEM-s | SRLEM | Decommission, remove, or transfer to another project | Not necessary for population status and trends monitoring. |
| HYC | Yes | SRLEM-s | SRLEM | Continue funding | - |
| LRW | Yes | SRLEM-s | SRLEM | Continue funding | - |
| LLS | Yes | SRLEM-s | SRLEM | Decommission, remove, or transfer to another project | Not necessary for population status and trends monitoring. |
| BTL | Yes | SRLEM-s | SRLEM | Decommission, remove, or transfer to another project | Not necessary for population status and trends monitoring. |
| CAC | Yes | SRLEM-s | SRLEM | Decommission, remove, or transfer to another project | Not necessary for population status and trends monitoring. |
| NFS | Yes | SRNFS-s | SRNFS | Continue funding | - |
| PCA | No | SRPAN-s | SRPAN | Candidate to transfer to project | If transferring PCA to the project is not desired, ensure long-term funding of the site. |
| Middle Fork Salmon | | | | | |
| - | - | SRCHA-s | SRCHA | Add IPTDS | An IPTDS should be added within the SRCHA-s and SRCHA populations. Ideally, the site would be located near the lower end of Chamberlain Creek, the only major spawning area within both populations. Secondary options include upper Chamberlain Creek (near the airstrip), or in one of the five steelhead minor spawning areas (Sabe, Bargamin, Warren, Crooked, or Sheep creeks). |
| MAR | Yes | MFUMA-s | MFMAR | Continue funding | - |
| TAY | Yes | MFBIG-s | MFBIG | Continue funding | - |
| South Fork Salmon | | | | | |
| SFG | Yes | SFMAI-s | SFSMA | Continue funding | SFMAI-s and SFSEC-s are the only two populations within the MPG with a high B-run component, and thus, high-precision monitoring is desired. Additionally, SFG is being considered as an experimental location to monitor reach-specific juvenile survival and aids coverage and precision of abundance estimates for these populations. |
| KRS | Yes | SFMAI-s | SFSMA | Continue funding |
| ESS | Yes | SFMAI-s | SFEFS | Continue funding |
| ZEN | Yes | SFSEC-s | SFSEC | Continue funding |
| - | - | SRLSR-s | SRLSR | Add IPTDS | An IPTDS should be considered within the SRLSR-s and SRLSR populations. Ideally, the site would be located in the lower Little Salmon River. Secondary options include Slate Creek or Whitebird Creek. |
| Middle Fork Clearwater | | | | | |
| SW1 | No | CRSEL-s | SEUMA / SEMEA / SEMOO | Candidate to transfer to project | Strong candidates to be transferred to the project; the CRSEL-s population is only monitored using IPTDS and the population contains a high B-run component. |
| SW2 | No | CRSEL-s | SEUMA / SEMEA / SEMOO | Candidate to transfer to project |
| LRL | Yes | CRLOC-s | CRLOC | Continue funding | - |
| LRU | Yes | CRLOC-s | CRLOC | Continue funding | - |
| South Fork Clearwater | | | | | |
| SC1 | Yes | CRSFC-s | SCUMA | Continue funding | Recommended to move SC2 to the lower boundary of the CRSFC-s population, where Hwy 13 crosses the South Fork Clearwater River. SC2, in the new location, could be a two-pass configuration (with sufficient distance between arrays), or preferably, one additional site upstream of SC2 (SC3, SC4, or CRA) should be operated upstream of SC2 to allow an estimate of detection probability. In spawn years 2022 and 2023, CRA only detected one steelhead in each year, and so SC3 or SC4 would be preferred for funding under the project. |
| SC2 | Yes | CRSFC-s | SCUMA | Continue funding |
| SC3 | No | CRSFC-s | SCUMA | Candidate to transfer to project |
| SC4 | No | CRSFC-s | SCUMA | Candidate to transfer to project |
| CRA | Yes | CRSFC-s | SCUMA | Decommission, remove, or transfer to another project |
| Lower Clearwater | | | | | |
| LC1 | Yes | CRLOL-s | CRLOL | Continue funding | - |
| LC2 | Yes | CRLOL-s | CRLOL | Continue funding | Alternate locations for LC2 could be considered to reduce O&M time and costs. LC2 could either be moved down with LC1 (assuming arrays could be spaced sufficiently to ensure independent detections) or it could be moved upstream (but still below core spawning areas). |
| LAP | No | CRLMA-s | CRLAP | Candidate to transfer to project | An existing IPTDS within the CRLMA-s population should be funded under the project. Candidates include locations in the lower Potlatch River (e.g., JUL), LAP, or LAW. Alternatively, a new IPTDS in Big Canyon Creek could be considered. |
| JUL | No | CRLMA-s | CRPOT | Candidate to transfer to project |
| LAW | No | CRLMA-s | SCLAW | Candidate to transfer to project |
| Imnaha | | | | | |
| IR1 | Yes | IRMAI-s | IRMAI | Continue funding | Because IRMAI-s is the only steelhead population in the MPG, high-precision monitoring is required. IR1 provides the greatest coverage for both species. In addition, two sites upstream, including IR2, should be funded to ensure adequate detections to estimate abundance at IR1. IR3 would be preferred over BSC as it receives more detections, on average, for both species; further, estimates of abundance from IR2 and IR3, combined, can be used to estimate abundance for the IRBSH Chinook salmon population. COC is not needed for status and trends monitoring as it only provides coverage for a steelhead minor spawning area. |
| IR2 | Yes | IRMAI-s | IRMAI | Continue funding |
| IR3 | Yes | IRMAI-s | IRMAI | Continue funding |
| COC | Yes | IRMAI-s | IRMAI | Decommission, remove, or transfer to another project |
| BSC | Yes | IRMAI-s | IRBSH | Decommission, remove, or transfer to another project |
| Grande Ronde | | | | | |
| UGR | Yes | GRUMA-s | GRCAT / GRUMA | Continue funding | - |
| WR1 | Yes | GRWAL-s | GRLOS | Continue funding | WR1 should continue to be funded under the project. A two-pass array at MR1 would allow an estimate of a detection probability at both WR1 and the lower array and MR1 and allow parsing of abundance among steelhead major spawning areas and sp/sum Chinook populations. However, estimates of detection probabilities at WR1 have been found to be biased due to Minam and Wallowa adults "sorting" by the time they arrive to WR1. Therefore, a single-pass array at WR2 should also be funded under the project to ensure unbiased detection probability estimates. |
| WR2 | No | GRWAL-s | GRLOS | Candidate to transfer to project |
| MR1 | No | GRWAL-s | GRMIN | Candidate to transfer to project |
| WEN | No | GRLMT-s | GRWEN | Candidate to transfer to project | An IPTDS site below a major spawning area within the GRLMT-s population is necessary to ensure low-precision monitoring. If transferring WEN to the project is not desired, ensure long-term funding of the site. |
| JOC | Yes | GRJOS-s | NA | Continue funding | - |
| Lower Snake | | | | | |
| ACM | No | SNASO-s | SNASO | Candidate to transfer to project | If transferring ACM to the project is not desired, ensure long-term funding of the site. |
| Alpowa Creek | - | SNASO-s | - | Add IPTDS | Add an IPTDS in lower Alpowa Creek to ensure high-precison monitoring of one steelhead population within the MPG. |

## Snake River Basin Steelhead DPS

### Salmon River MPG

Funding for O&M is currently provided for 17 IPTDS sites within the Salmon River MPG. We recommend the continued funding of O&M for 11 of those sites currently funded under the project (VC2, LLR, LRW, HYC, NFS, MAR, TAY, SFG, KRS, ESS, ZEN), adding two sites (YFK and PCA) to ensure precise and long-term monitoring of the SRUMA-s and SRPAN-s populations, respectively, and considering adding three proposed sites to cover existing population monitoring gaps for a total of 16 sites funded under the IPTDS O&M project. Proposed sites include one in the lower East Fork Salmon, one in Chamberlain Creek, and one in the SRLSR-s population (lower Little Salmon River, Slate Creek, or Whitebird Creek).

The SRLEM-s population is a strong candidate for high-precision monitoring due to extensive restoration actions and various RM&E activities in the watershed. Currently, the IPTDS O&M project funds seven sites within the SRLEM-s population; however, only three sites are necessary to obtain high-precision monitoring of abundance and distribution: LLR, LRW, and HYC. The remaining four sites (BHC, LLS, BTL, and CAC) could be considered for decommissioning, removal, or transfer to other projects.

The SFMAI-s population is currently monitored with high precision using SFG, KRS, and ESS combined. Although high-precision monitoring in the population is not required according to ASMS guidelines (CBCAMW 2010) because other populations within the MPG are monitored with high precision, it is desired because the population is one of two populations within the MPG with a high B-run component and is targeted for viability or high viability. In addition, the SFG site is currently being considered for experimental juvenile survival monitoring. Funding under the IPTDS O&M project should be continued for each of SFG, KRS, and ESS.

The SRPAH-s population is currently monitored using a combination of the Pahsimeroi Hatchery weir and USE and USI (both O&M funded). The USE site provides more complete population coverage than USI and the weir; however, an estimate of abundance at USE is reliant on observations at USI and sites upstream (including Pahsimeroi Hatchery weir) to estimate a detection probability. Further, sites don’t exist in appropriate locations upstream to effectively “parse” abundance estimates to the SRUMA-s and SREFS-s populations from abundance at USE to estimate abundance for the SRPAH-s population. Because other populations within the MPG are monitored with high-precision, USI could be considered for decommissioning or removal; however, SREFS-s is currently a data gap and should be considered (see below).

We recommend considering funding YFK and PCA under the IPTDS O&M project. YFK aids in parsing abundance among the SRUMA-s, SREFS-s, and SRPAH-s populations and PCA would ensure long-term monitoring of the SRPAN-s population. Finally, we recommend new (proposed) sites in the SREFS-s, SRCHA-s, and SRLSR-s populations to address existing data gaps and ensure at least low-precision monitoring for all populations in the MPG.

**Table 5.** Populations within the Salmon River MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- |
| SRUMA-s | Salmon River upper mainstem | Extant | Low | Other populations within the MPG are currently monitored with high precision, and so only low precision monitoring is necessary. Because no other major spawning areas are monitored using O&M funded IPTDS, VC2 should continue to be funded. Before operation of YFK, the minimum CV of IPTDS-based abundance estimates was 44.4%; since operation of YFK, CVs have been <15.0% in 6 of 11 years. | Continue funding VC2. Consider funding YFK under IPTDS O&M project or adding a site at lower end of population (e.g., near Clayton) to aid in parsing SRUMA-s, SREFS-s, and SRPAH-s estimates. |
| SREFS-s | East Fork Salmon River | Extant | Data Gap | No monitoring currently occurs within the population i.e., the SREFS-s population is considered a data gap, and current IPTDS-based estimates for the population are unreliable and partially reliant on USI and SALEFT. An IPTDS should be considered to monitor a (large) portion of at least one major spawning area; possible locations include the lower East Fork Salmon River (East Fork major spawning area), Morgan Creek (Challis major spawning area), or the mainstem Salmon River near the downstream boundary of the SREFS-s population. | Add IPTDS in East Fork Salmon River or in mainstem Salmon River near downstream boundary of population (e.g., below Morgan Creek or near Challis). |
| SRPAH-s | Pahsimeroi River | Extant | High | The SRPAH-s population is currently monitored using the Pahsimeroi Hatchery weir. IPTDS-based estimates to SRPAH-s are partially reliant on USE and USI, which are O&M-funded. USE provides more complete population coverage than the weir; however, the weir covers all 3 major spawning areas (part of one) and most of the high IP habitat in the population. Further, sites don’t currently exist upstream to appropriately parse abundance estimates to the SRUMA-s and SREFS-s populations from abundance at USE to estimate abundance for the SRPAH-s population. Since other populations within the MPG are monitored with high precision, USE and USI could be considered for decommissioning, so long as additional sites were maintained or added upstream to appropriately estimate abundance to the SRUMA-s and SREFS-s populations. | Consider decommissioning USE and USI. If so, consider adding a site in the mainstem Salmon River near the lower boundary of SREFS-s population and/or in the East Fork Salmon. |
| SRLEM-s | Lemhi River | Extant | High | SRLEM-s is a strong candidate to maintain for high-precision monitoring despite other populations within the MPG also being high-precision, given that the Lemhi River is an Intensively Monitored Watershed with various RM&E activities within the population. However, for status and trends monitoring, LLR, LRW, and HYC are of highest priority for population and major spawning area monitoring. Other O&M funded sites (e.g., BHC, LLS, BTL, CAC) don’t need to be funded by the IPTDS O&M project. | Continue funding LLR, LRW, HYC. Remove BHC, LLS, BTL, and CAC from the project. |
| SRNFS-s | North Fork Salmon River | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in SRNFS-s is only monitored using IPTDS and other low-precision methods are less or not feasible. Funding was previously added to the project to operate NFS. | Continue funding NFS. |
| SRPAN-s | Panther Creek | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in SRPAN-s is only monitored using IPTDS and other low-precision methods are less or not feasible. The PCA site could be considered for funding under the IPTDS O&M project to ensure long-term monitoring. | Consider funding PCA under IPTDS O&M project. |
| SRCHA-s | Chamberlain Creek | Extant | Data Gap | The SRCHA-s population is currently considered a data gap and either low- or high-precision monitoring is necessary. An IPTDS near the mouth of Chamberlain Creek, the lone major spawning area, or at least below much of the available spawning habitat, could be considered, if feasible, and would provide high-precision monitoring. Alternatively, low-precision methods, including IPTDS in Bargamin Creek (a minor spawning area) or (e.g., genetic-based effective population size monitoring) in various tributaries, including Bargamin and/or Chamberlain creeks, throughout the population could also be considered. | Consider an IPTDS in Chamberlain Creek, if feasible. Alternately, an IPTDS in Bargamin Creek or other low-precision methods could be considered. |
| MFUMA-s | Middle Fork Salmon River upper mainstem | Extant | Low | One (Marsh Creek) of six major spawning areas within the population is monitored using O&M-funded IPTDS, which is the only adult escapement monitoring method in the population. The remaining five (Lower Bear, Upper Middle Fork Salmon, Rapid, Pistol, Marble) are unmonitored for adult escapement. Other populations within the MPG are currently monitored with high precision, and so only low precision monitoring is necessary. Funding was previously added to the project to operate MAR. | Continue funding MAR. |
| MFBIG-s | Big, Camas, and Loon Creek | Extant | Low | Three (Lower Big, Upper Big, Monumental) of five major spawning areas within the population are currently monitored (combined) by TAY, which is the only adult escapement monitoring method in the population. The remaining two (Upper Loon, Camas) are unmonitored for adult escapement. Other populations within the MPG are currently monitored with high precision, and so only low precision monitoring is necessary. | Continue funding TAY |
| SFMAI-s | South Fork Salmon River | Extant | High | Other populations within the MPG are monitored with high precision; and so only low-precision monitoring is required; however, SFMAI-s is one of only two populations within the MPG with a high (>40%) B-run component, and thus, high-precision monitoring is desired. ESS covers two major spawning areas and KRS covers one major and to minor spawning areas and KRS aids life-cycle monitoring for steelhead and sp/sum Chinook salmon. Additionally, SFG aids coverage and precision of the SFMAI-s and SFSEC-s estimates and is being considered as an experimental site to monitor juvenile survival. | Continue funding SFG, KRS, and ESS. |
| SFSEC-s | Secesh River | Extant | High | Other populations within the MPG are monitored with high precision; and so only low-precision monitoring is required; however, SFSEC-s is one of only two populations within the MPG with a high (>40%) B-run component, and thus, high-precision monitoring is desired. Additionally, SFG aids coverage and precision of the SFMAI-s and SFSEC-s estimates and is being considered as an experimental site to monitor juvenile survival. | Continue funding ZEN. |
| SRLSR-s | Little Salmon and Rapid River | Extant | Data Gap | The SRLSR-s population is currently a data gap and either high- or low-precision monitoring is necessary. High-precision monitoring could be accomplished at the mouth of the Little Salmon River (only major spawning area); Low-precision monitoring could be accomplished with an IPTDS near the mouth of a minor (e.g., Rock, Whitebird, Skookumchuck, Slate) spawning area. Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. | Consider adding an IPTDS near the mouth of the Little Salmon River, if feasible; alternatively, consider a site below a minor spawning area (e.g., Whitebird or Slate creeks). |

### Clearwater River MPG

Funding for O&M is currently provided for seven IPTDS sites (CRA, SC1, SC2, LC1, LC2, LRL, LRU) within the Clearwater River MPG. We recommend the continued funding of O&M for five sites as currently configured (SC1, LC1, LC2, LRL, LRU) and adding two existing sites (SW1 and SW2) to ensure long-term monitoring of the CRSEL-s population. In addition, at least two other sites within the CRSFC-s and CRLMA-s populations should be considered for funding; however, those don’t necessarily need to be SC2 or CRA, at least as currently configured.

To improve population status and trends monitoring for steelhead in the MPG, alternate site configurations could be considered within the CRSFC-s and CRLMA-s populations. For example, either the SC1 or SC2 (likely SC2) site could be moved to near the bottom boundary of the CRSFC-s population; alternately, an IPDTS near the bottom of a major spawning area within the CRLMA-s population could be considered. Existing sites within the CRLMA-s population to consider include JUL (Potlatch River), LAP (Lapwai Creek), or LAW (Lawyer Creek); LAP would be a good candidate due to reliable operation and to continue the existing time-series of abundance estimates. Regardless, one site within the CRSFC-s population should be funded under the IPTDS O&M project to facilitate estimates of detection probabilities at downriver sites, but that site doesn’t necessarily need to be CRA. Low-precision monitoring for these two populations could likely be accomplished with better coverage and improved cost-savings by using 1) different site/array configurations, 2) funding alternate sites, or 3) a combination of both.

Two arrays should continue to be funded within the CRLOL-s population. However, LC2 is currently located at a site which is difficult for O&M. To reduce time and costs, it could be considered to either convert LC1 to a two-pass configuration (assuming arrays could be adequately spaced to ensure independent observations) or move LC2 upstream to a location easier for O&M, preferably downstream of major spawning areas.

**Table 6.** Populations within the Clearwater River MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- |
| CRSEL-s | Selway River | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in CRSEL-s is only monitored using IPTDS and other low-precision methods are less or not feasible. Detections at SW2 facilitate estimating the detection probability (and abundance) at SW1. The population contains a high (>40%) B-run component (NOAA 2017). | Consider funding SW1 and SW2 under IPTDS O&M project. |
| CRLOC-s | Lochsa River | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in CRSEL-s is only monitored using IPTDS and other low-precision methods are less or not feasible. Detections at LRU facilitate estimating the detection probability (and abundance) at LRL. The population contains a high (>40%) B-run component and is targeted for viability or high viability (NOAA 2017). | Continue funding LRL and LRU. |
| CRSFC-s | South Fork Clearwater River | Extant | Low | Other populations within the MPG are currently monitored with high precision, and so only low precision monitoring is necessary. An estimate for one tributary, Crooked River, within the population is currently possible using the two-pass CRA site. SC1 and SC2, combined, allow for an abundance estimate for the entire South Fork Clearwater watershed; however, the CRSFC-s lower population boundary occurs well upstream of SC2 where Hwy 13 crosses the South Fork Clearwater River and abundance estimates at SC1 don’t account for e.g., pre-spawn or harvest mortality or spawning that occurs below the CRSFC-s population boundary. If improved monitoring was desired for the steelhead (and Chinook salmon) population, a site could be considered near the crossing of Hwy 13 and below any major spawning areas (Newsome [includes Crooked River], American, Upper South Fork). If a site was moved to this new location, SC1 or SC2 could potentially be removed; the new site would either need to be a two-pass configuration or sites upstream (e.g., SC3, SC4, CRA) would need to be maintained to ensure that detection probabilities could be estimated. The population contains a high (>40%) B-run component (NOAA 2017). | No action needed to maintain low-precision monitoring. Alternate site configurations, including for SC1 and SC2, could be considered to improve cost-savings for the CRSFC-s and CRLMA-s populations. |
| CRLOL-s | Lolo Creek | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in CRLOL-s is only monitored using IPTDS and other low-precision methods are less or not feasible. Detections at LC2 facilitate estimating the detection probability (and abundance) at LC1; however, LC2 is a difficult site for O&M, so it could be considered to convert LC1 to a two-pass configuration or to move LC2 upstream in the watershed to an easier access location, but preferably downstream of major spawning areas. The population contains a high (>40%) B-run component and is targeted for viability or high viability (NOAA 2017). | Continue funding LC1 and LC2; consider changes to array configurations to reduce long-term costs |
| CRNFC-s | North Fork Clearwater River | Extirpated | - | - | - |
| CRLMA-s | Clearwater River lower mainstem | Extant | Low | Other populations within the MPG are monitored with high precision; however, adult escapement in CRLMA-s is only monitored using IPTDS and other low-precision estimates are less or not feasible. Two sites within the population are currently funded under the IPTDS O&M project (SC1 and SC2), but as noted above, those sites provide estimate of abundance for the South Fork Clearwater River, and not necessarily the CRSFC-s population (or the Lower SF Clearwater Tribs major spawning area). Alternatively, a site should be considered near the bottom of a major spawning area (Potlatch [JUL], Lapwai [LAP], Lawyer [LAW], Big Canyon, Lower SF Clearwater Tribs [SC1 or SC2]) within the CRLMA-s population funded under the IPTDS O&M project. Moving SC1 or SC2 to a new location at the bottom of CRSFC-s or moving/funding SC3 (which occurs below all major spawning areas within CRSFC-s), would allow parsing estimates for the CRSFC-s population and Lower SF Clearwater tribs major spawning area. | Consider altering site configurations within the population including for SC1 and SC2, to improve cost-savings and monitoring precision for both CRSFC-s and CRLMA-s populations. Consider funding LAP or LAW under the IPTDS O&M project, recognizing historical difficulties in operating JUL. |

### Imnaha River MPG

Funding for O&M is currently provided for five IPTDS sites within the Imnaha River MPG (COC, IR1, IR2, IR3, BSC). We recommend the continued funding of O&M for at least three sites currently funded by the IPTDS O&M project: IR1, IR2, and IR3. Detections at IR2 and IR3 would ensure adequate detections to reliably estimate detection probability and abundance at IR1 and provide high-precision status and trends monitoring. High-precision monitoring is required for the IRMAI-s population since it is the only population in the MPG.

**Table 7.** Populations within the Imnaha River MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- |
| IRMAI-s | Imnaha River | Extant | High | IRMAI-s is the only population in the MPG and targeted for high viability (NOAA 2017) and so should be monitored with high precision. High-resolution monitoring could be accomplished using IR1 as the site is below all major spawning areas. Although only one additional array upstream or IR1 could provide estimates of detection probability at IR1, two additional arrays/sites upstream should be funded under the IPTDS O&M project to provide redundancy and ensure annual estimation of detection probabilities at IR1. Currently, five sites within the population are funded under the project; however, only three are needed to estimate abundance at IR1 for status and trends monitoring. COC would provide complete coverage for the population, but is not necessary, as Cow Creek is a minor spawning area. | Continue funding IR1 plus two additional sites upstream. |

### Grande Ronde River MPG

Funding of O&M is currently provided for three sites within the Grande Ronde MPG. We recommend the continued funding for each of these (UGR, WR1, and JOC); in addition, WEN should be considered for funding under the project.

Alternative site or array configurations for the GRWAL-s population could be considered to reduce time and costs and improve population status and trends monitoring, if desired.

**Table 8.** Populations within the Grande Ronde River MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| GRUMA-s | Grande Ronde River upper mainstem | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. UGR, currently funded by the IPTDS O&M project, provides low-precision monitoring as it doesn’t capture abundance for the Lookingglass major spawning area. | Continue funding UGR. |
| GRWAL-s | Wallowa River | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. WR1, funded under the IPTDS O&M project, is a single-pass array used to estimate abundance for the GRWAL-s population, but relies on two upstream sites not funded under the project (MR1 and WR2). Continued funding of WR1 and adding MR1 and WR2 would ensure continued high-precision monitoring. Alternatively, funding either MR1 (Minam) or WR2 (Wallowa, Upper Wallowa, Lostine) would provide low-precision monitoring of one or three major spawning areas, respectively. | Continue funding WR1 and begin funding MR1 and WR2 if high-precision monitoring is desired; alternatively, consider funding WR2 if low-precision monitoring is adequate. |
| GRJOS-s | Joseph Creek | Extant | High | Other populations within the MPG are monitored with high precision; however, adult escapement in GRJOS-s is only monitored using IPTDS and other low-precision methods are less or not feasible. Moreover, JOC is a two-pass array site and is in an ideal location for population status and trends monitoring and so should be maintained to ensure high-precision monitoring of a population within the Grande Ronde River MPG. | Continue funding JOC. |
| GRLMT-s | Grande Ronde River lower mainstem tributaries | Extant | Low | Other populations within the MPG are monitored with high precision; however, adult escapement in GRLMT-s is only monitored using IPTDS and other low-precision methods are less or not feasible. WEN, the only site within the population monitoring adult status and trends, is currently not funded under the IPTDS O&M project, and so should be considered for funding under the project. | Consider funding WEN. |

### Hells Canyon MPG

The lone population in the MPG (SNHCT-s) is listed as extirpated, and so no considerations for the MPG were made.

**Table 9.** Populations within the Hells Canyon MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- |
| SNHCT-s | Hells Canyon | Extirpated | - | - | - |

### Lower Snake MPG

Currently, neither of the two steelhead populations within the Lower Snake MPG are monitored with high precision, including using IPTDS. Current IPTDS-based monitoring in the SNTUC-s populations using systematic tagging at LGR is not feasible because abundance estimates are reliant on “fallbacks” from the dam, which are not representative of the run-at-large into the population. Current abundance estimates for the SNASO-s population do not account for abundance in the Alpowa Creek major spawning area, and so are considered low-precision. Because SNASO-s occurs upstream of Lower Granite Dam, high precision adult escapement monitoring based on tagging at LGR is feasible. We recommend funding an IPTDS in lower Asotic Creek (e.g., ACM) and consider adding a site in Alpowa Creek to ensure long-term, high-precision monitoring. No action is needed in SNTUC-s if existing monitoring in the population continues.

**Table 10.** Populations within the Lower Snake MPG, Snake River Basin Steelhead DPS including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- |
| SNASO-s | Asotin Creek | Extant | Low | Neither population within the MPG is monitored with high precision; IPTDS-based monitoring in the SNTUC-s population is (at least partially) reliant on “fallbacks” PIT-tagged at Lower Granite Dam and no IPTDS-based monitoring occurs in Alpowa Creek, a major spawning area in SNASO-s. High-precision monitoring within the SNASO-s is likely more feasible because it occurs upstream of Lower Granite Dam. | Consider funding ACM; consider adding site in Alpowa Creek. |
| SNTUC-s | Tucannon River | Extant | Low | Neither population within the MPG is monitored with high precision; IPTDS-based monitoring in the SNTUC-s population is (at least partially) reliant on “fallbacks” PIT-tagged at Lower Granite Dam. High-precision monitoring within the SNASO-s is more feasible because it occurs upstream of Lower Granite Dam. No action is needed, if alternative low-precision monitoring continues. | No action needed, if alternative low-precision monitoring continues. |

## Snake River Spring/Summer-run Chinook Salmon ESU

### Upper Salmon River MPG

Funding for O&M is currently provided for 11 IPTDS sites within the Upper Salmon River MPG (VC2, USI, USE, LLR, LRW, HYC, BHC, LLS, BTL, CAC, NFS). We recommend the continued funding for six of these sites: VC2, USE, LLR, LRW, HYC, and NFS. Five sites could be removed, decommissioned, or funded by other project as their data are not integral for population status and trends monitoring: USI, BHC, LLS, BTL, and CAC). One proposed site is recommended under the IPTDS O&M project to provide monitoring for the SREFS-s steelhead population, which would also provide improved monitoring for the SREFS Chinook salmon population and Upper Salmon MPG. A site in the lower East Fork Salmon River would better allow for parsing of IPTDS-based abundance estimates throughout the Upper Salmon River subbasin. YFK and PCA are recommended to be considered for funding under the project to improve steelhead monitoring; these sites would additionally improve monitoring for the SRYFS and SRPAN Chinook salmon populations, respectively.

**Table 11.** Populations within the Upper Salmon MPG, Snake River Spring/Summer-run Chinook Salmon ESU including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Run | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- | --- |
| SRUMA | Salmon River upper mainstem above Redfish Lake | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRUMA population is monitored using the Sawtooth Hatchery weir and redd counts[[5]](#footnote-5) (boat, ground, UAS); no additional monitoring necessary. Current IPTD-based abundance estimates in SRUMA use detections at RFL and STL. | No action needed. |
| SRVAL | Valley Creek | Spring / Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRVAL population is monitored using redd counts (ground). VC2 is the only site within the SRVAL-s steelhead population and is recommended for continued funding. | Continue funding VC2. |
| SRLMA | Salmon River lower mainstem below Redfish Lake | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRLMA population is monitored using redd counts (UAS). In addition, USE and USI, which are O&M funded, currently provide monitoring for the population. Estimates of abundance at USE are partially reliant on observations at USI and upstream to estimate a detection probability at USE. Further, some sites don’t exist upstream to appropriately parse abundance estimates to e.g., SREFS from SRLMA. Because other populations are monitored with high precision, USI could be considered for removal from the project, especially if other upstream sites provide adequate detections to estimate a detection probability at USE. | Consider removing USI from IPTDS O&M project. |
| SRYFS | Yankee Fork Salmon River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRYFS population is currently monitored using a weir, the YFK site, and redd counts (ground, UAS); no additional methods needed. | No action needed. Consider funding YFK under IPTDS O&M project. |
| SREFS | East Fork Salmon River | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SREFS population is currently monitored using redd counts (ground, UAS). An IPTDS is recommended for the lower East Fork Salmon River to address monitoring for the SREFS-s steelhead populations, which would improve overall monitoring for the SREFS population and Upper Salmon River Chinook salmon MPG. | No action needed; however, a new site proposed for steelhead would improve monitoring for the Chinook salmon population and MPG. |
| SRPAH | Pahsimeroi River | Summer | Extant | High | The SRPAH population is the only summer-run population in the MPG and so high-precision monitoring is required. The Pahsimeroi Hatchery weir currently provides high-precision monitoring for the population, and the population is also monitoring with redd counts (ground, UAS). No IPTDS necessary, so long as the Pahsimeroi Hatchery weir continues to operate. | No action needed. |
| SRLEM | Lemhi River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRLEM population is monitored using redd counts (ground, UAS), which provides low-precision monitoring. However, the SRLEM population is a strong candidate for high-precision monitoring despite other populations in the MPG also being monitored with high precision, given that it is an Intensively Monitored Watershed with various RM&E activities. For steelhead, it is recommended that LLR, LRW, and HYC are of highest priority for status and trends monitoring and would provide additional monitoring for SRLEM. Other O&M funded sites (e.g., BHC, LLS, BTL, CAC) don’t need to be funded by the IPTDS O&M project. | Continue funding LLR, LRW, HYC; consider removing BHC, LLS, BTL, CAC from the IPTDS O&M project. |
| SRNFS | North Fork Salmon River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRNFS is currently monitored using redd counts (ground). The NFS site is recommended for continued monitoring of the SRNFS-s steelhead population and provides improved monitoring for the SRNFS Chinook salmon population. | No action needed; continue funding NFS. |
| SRPAN | Panther Creek | Unknown | Extirpated | - | - | - |

### Middle Fork Salmon River MPG

Funding for O&M is currently provided for two IPTDS sites within the Middle Fork Salmon River MPG (MAR, TAY), and we recommend continued funding of those sites.

**Table 12.** Populations within the Middle Fork Salmon River MPG, Snake River Spring/Summer-run Chinook Salmon ESU including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Run | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- | --- |
| MFBEA | Bear Valley Creek | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. MFBEA is currently monitored using the Bear Valley weir and redd counts (ground). No action needed. If the Bear Valley weir were to be removed, an IPTDS funded under the O&M project should be considered. | No action needed. |
| MFMAR | Marsh Creek | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. MFMAR is currently monitored using MAR and redd counts (ground). The MAR site is recommended for continued monitoring of the MFUMA-s steelhead population and provides improved monitoring for the MFMAR Chinook salmon population. | No action needed; continue funding MAR. |
| MFSUL | Sulphur Creek | Spring | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. MFSUL is current monitored using redd counts (ground); no additional monitoring needed. | No action needed. |
| MFUMA | Middle Fork Salmon River above Indian Creek | Spring | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. Through SY2023, MFUMA was monitored using helicopter-based index redd count surveys; starting in SY2024 it is anticipated that multiple-pass raft-based redd counts will continue aided by ground-based counts in a portion of Rapid River. | No action needed. |
| MFLMA | Middle Fork Salmon River below Indian Creek | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. Through SY2023, MFUMA was monitored using helicopter-based index redd count surveys; starting in SY2024 it is anticipated that multiple-pass raft-based redd counts will continue. | No action needed. |
| MFLOO | Loon Creek | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. Through SY2023, MFLOO was monitored using helicopter-based index redd count surveys; starting in SY2024 it is anticipated that ground-based redd counts will continue for a small portion of the population. | No action needed. |
| MFCAM | Camas Creek | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. Through SY2023, MFLOO was monitored using helicopter-based index redd count surveys; starting in SY2024 it is anticipated that ground-based redd counts will continue for a small portion of the population. | No action needed. |
| MFBIG | Big Creek | Spring / Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. However, the MFBIG population provides a unique opportunity for high-resolution monitoring of a (largely) wilderness population paired with a rotary screw trap and is only one of two populations in the MPG with IPTDS-based high-resolution monitoring. The TAY IPTDS provides monitoring for three major spawning areas (Lower Big, Monumental, Upper Big). | Continue funding TAY. |
| SRCHA | Chamberlain Creek | Spring | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. SRCHA is currently monitored using index redd count surveys; no additional methods needed. | No action needed. |

### South Fork Salmon River MPG

No action needed. We recommend the continued funding of O&M for each of the fours sites that are currently managed by the IPTDS O&M project: SFG, KRS, ESS, and ZEN.

**Table 13.** Populations within the South Fork Salmon River MPG, Snake River Spring/Summer-run Chinook Salmon ESU including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Run | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- | --- |
| SFSMA | South Fork Salmon River mainstem | Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low precision monitoring is required. SFSMA is currently monitored using SFG and KRS, (using ZEN and ESS to parse those populations), the South Fork Salmon River weir, and redd count surveys (ground). The population could be monitored with low precision without SFG or KRS, but it is recommended that either ESS or KRS continue to be funded to ensure monitoring of the SFMAI-s steelhead population. Further, precision and coverage of estimates are aided by the SFG site (which is also being considered as an experimental site to monitor juvenile survival and aids in in-season fisheries management). SFG or KRS could be considered for decommissioning for sp/sum Chinook salmon but are recommended for monitoring the SFMAI-s steelhead population. | Continue funding SFG and KRS. |
| SFEFS | East Fork South Fork Salmon River | Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SFEFS population is currently monitored using ESS, the Johnson Creek weir, and redd count surveys (ground). The population could be monitored with low precision without ESS, but if so, either the SFSMA or SFSEC populations need to be monitored with high precision i.e., using KRS or ZEN. Moreover, continued funding of ESS is recommended for monitoring the SFMAI-s steelhead population. | Continue funding ESS. |
| SFSEC | Secesh River | Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SFSEC population is currently monitored using ZEN and redd count surveys (ground). The SFSEC population could be monitored with low precision without ZEN; however, ZEN is needed for monitoring the SFSEC-s steelhead population. | Continue funding ZEN. |
| SRLSR | Little Salmon River | Spring / Summer | Extant | Low | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The SRLSR population is currently monitored using redd count surveys (ground); no additional methods needed. | No action needed. |

### Grande Ronde / Imnaha River MPG

Recommendations for the MPG are largely driven by recommendations for the Imnaha River and Grande Ronde River MPGs for the Snake River Basin steelhead DPS. Funding for O&M is currently provided for eight IPTDS sites within the Grande Ronde / Imnaha River MPG (IR1, IR2, IR3, COC, BSC, JOC, WR1, UGR). We recommend the continued funding for three sites currently managed by the IPTDS O&M project (IR1, UGR, WR1) plus two additional sites within the Imnaha River (likely IR2 and IR3) to ensure adequate detections to estimate high-precision abundance at IR1. MR1 and WEN should be considered for funding under the project to maintain appropriate monitoring for steelhead, which would additionally ensure high-precision monitoring for the GRMIN and GRWEN Chinook salmon populations.

**Table 14.** Populations within the Grande Ronde / Imnaha River MPG, Snake River Spring/Summer-run Chinook Salmon ESU including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Run | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- | --- |
| IRBSH | Big Sheep Creek | Spring | Functionally Extirpated | - | - | - |
| IRMAI | Imnaha River mainstem | Spring / Summer | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. High-precision monitoring is required for the IRMAI-s steelhead population and so those considerations/recommendations should be followed. | Continue funding IR1 plus two additional sites upstream. |
| GRUMA | Grande Ronde River upper mainstem | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The GRUMA population is currently monitored using a weir and redd counts; additionally, UGR provides an abundance estimate for the combined GRUMA and GRCAT populations. | No action needed; continue funding UGR. |
| GRCAT | Catherine Creek | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The GRUMA population is currently monitored using a weir and redd counts; additionally, UGR provides an abundance estimate for the combined GRUMA and GRCAT populations. | No action needed; continue funding UGR. |
| GRLOO | Lookingglass Creek | Unknown | Functionally Extirpated | - | - | - |
| GRMIN | Minam River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. MR1, currently not funded under the IPTDS O&M project, is recommended for funding to improve monitoring of the GRWAL-s steelhead population. Funding MR1 would additionally ensure high-resolution monitoring for at least one population in the Chinook salmon MPG. | Consider funding MR1 under the IPTDS O&M project. |
| GRLOS | Lostine River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. The GRLOS population is currently monitored using a weir, redd counts surveys, and WR1 and WR2 (using MR1 to “parse” abundance for the GRMIN population). WR1 is recommended for monitoring of the GRWAL-s steelhead population, and so those considerations/recommendations should be followed. | Continue funding WR1. |
| GRWEN | Wenaha River | Spring | Extant | High | Other populations within the MPG are monitored with high precision, and so only low-precision monitoring is required. WEN is recommended for monitoring of the GRLMT-s steelhead population, and so those considerations/recommendations should be followed. | Consider funding WEN under the IPTDS O&M project. |

### Lower Snake River MPG

The SNASO population is considered functionally extirpated, and thus, high-precision monitoring of the remaining SNTUC population is desired. Currently, no O&M project IPTDS exist in the MPG. Funding of an IPDTS site(s) could be considered for funding under the IPTDS O&M project if they could be used to support high-resolution monitoring.

**Table 15.** Populations within the Lower Snake River MPG, Snake River Spring/Summer-run Chinook Salmon ESU including their status, current level of status and trends monitoring, and considerations and recommendations for each population for funding of IPTDS O&M for adult abundance monitoring.

| Pop ID | Pop Name | Run | Status | Current Monitoring Type | Considerations | Recommendation |
| --- | --- | --- | --- | --- | --- | --- |
| SNASO | Asotin Creek | Spring | Functionally Extirpated | - | - | - |
| SNTUC | Tucannon River | Spring | Extant | High | The only other population in the MPG, SNASO, is considered functionally extirpated and so high-precision monitoring is desired. IPTDS-based abundance monitoring of the SNTUC-s population is (at least partially) reliant on “fallbacks” PIT-tagged at Lower Granite Dam, and so only provides low-precision monitoring. Alternate high-precision methods should be considered if not already in place; however, if IPTDS could be used to support high-precision monitoring, their funding could be considered under the IPTDS O&M project. | Consider funding IPTDS in the SNTUC population if they could support high-resolution monitoring. |

# DISCUSSION

* The attempt is to be as transparent and develop a framework (i.e., decision-making process) which will help make decisions as unambiguous as possible. However, “gray areas” are inevitable and, at least occasionally, professional judgement must be used which considers e.g., logistics, costs, site reliability, site feasibility, etc.
* Feasibility of proposed sites is an initial next step. If feasibility is not possible in locations, either alternate locations or methods need to be determined.
* In some cases, an estimate of abundance at a site funded by the IPTDS O&M project is reliant on detections at sites not funded by the project? Is it worth funding those sites under the IPTDS O&M project, at least in some cases?
* What should be considered for the most remote populations and/or watersheds/locations with very “flashy” hydrographs where IPTDS might not be feasible or appropriate? Are there alternatives e.g., genetic-based effective population size monitoring which could be viable low-precision methods? If so, we should consider paired abundance/Ne monitoring locations to better understand relationships between the two metrics.
* Discussion of what is meant by decommissioning and/or removal.
* The IPTDS O&M project funds IPTDS that are necessary for “near minimum” monitoring as suggested by the ASMS. However, we find those recommendations to be a low benchmark. Should we set the bar higher and/or should other IPTDS be funded under the project (e.g., those important for fishery management, hatchery evaluations, etc.)?

# LITERATURE CITED

Ackerman, M.W., B.K. Hand, R.K. Waples, G. Luikart, R.S. Waples, C.A. Steele, B.A. Garner, J. McCane, and M.R. Campbell. 2017. Effective Number of Breeders from Sibship Reconstruction: Empirical Evaluations using Hatchery Steelhead. Evolutionary Applications. 10(2):146-160. doi: 10.1111/eva.12433

Bowersox, B.J., J.S. Hargrove, T. Copeland, and M.R. Campbell. 2022. The Genetic Composition of Wild Steelhead Based on Spatial Proximity to a Hatchery. North American Journal of Fisheries Management. 43(2):431-450. https://doi.org/10.1002/nafm.10861

Columbia Basin Coordinated Anadromous Monitoring Workshop (CBCAMW). 2010. Anadromous Salmonid Monitoring Strategy Viable Salmonid Population Criteria and Subset of Tributary Habitat and Hatchery Effectiveness, Version 30062010. 59 pp.

Crawford, B.A. and S. Rumsey. 2009. Guidance for Monitoring Recovery of Pacific Northwest Salmon and Steelhead Listed Under the Federal Endangered Species Act (Idaho, Oregon, and Washington), DRAFT. NOAA’s National Marine Fisheries Service – Northwest Region. 129 pp.

Hargrove, J.S., M. Davison, and M.R. Campbell. 2022. Natural-origin Steelhead and Chinook Salmon Life History and Genetic Diversity at PIT Tag Detection Locations Throughout the Snake River Basin, Project Progress Report, 2021 Annual Report. Project Number 2010-026-00, Contract Number 79581. IDFG Report Number 22-13.

Interior Columbia Basin Technical Recovery Team (ICTRT). 2003. Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionary Significant Units Within the Interior Columbia River Domain, Working Draft.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionary significant units. U.S. Dept. Commer., NOAA Tech Memo. NMFS-NWFSC-42. 156 pp.

National Oceanic and Atmospheric Administration (NOAA). 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*) & Snake River Basin Steelhead (*Oncorhynchus mykiss*). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region. November 2017.

Pacific Northwest Aquatic Monitoring Partnership (PNAMP). 2009. High Level Indicators for Watershed Health and Salmon. May 12, 2009. 10 pp.

Poole, J.R., E.A. Felts, B. Barnett, M. Davison, M. Heller, R. Hand, and E. Brown. 2022. Idaho Adult Chinook Salmon Monitoring. Annual Report 2021. Idaho Department of Fish and Game Report 22-05.

# APPENDIX A. Recovery Scenarios for Snake River Populations

Table . Recovery scenarios for Snake River Basin Steelhead MPGs. Adapted from NOAA (2017).

| MPG & Pop ID | Population Name | Size Category | Adult Life History Type | Role In Scenario | Considerations |
| --- | --- | --- | --- | --- | --- |
| Salmon River | | | | | |
| SRUMA-s | Salmon River upper mainstem | Intermediate | A-Run | Viable or Maintained | Population has some hatchery influence, with some from out-of-MPG. There has been little monitoring of the population. |
| SREFS-s | East Fork Salmon River | Intermediate | A-Run | Viable or Maintained | Population has hatchery influence, with some from out-of-MPG. There has been little monitoring of the population. |
| SRPAH-s | Pahsimeroi River | Intermediate | A-Run | Viable or Maintained | Population has some hatchery influence from out-of-MPG. There has been little monitoring of the population. Active hatchery supplementation. |
| SRLEM-s | Lemhi River | Intermediate | A-Run | Viable or Maintained | Targeted for viability. Population has some hatchery influence from out-of-MPG. There has been little monitoring of the population. |
| SRNFS-s | North Fork Salmon River | Intermediate | A-Run | Viable or Maintained | Some hatchery influence from out-of-MPG stock. |
| SRPAN-s | Panther Creek | Basic | A-Run | Viable or Maintained | Targeted for viability. Some hatchery influence, likely from out-of-MPG. Watershed is publically owned, could become very productive. Fewer water withdrawals than other populations. |
| SRCHA-s | Chamberlain Creek | Basic | A-Run | Viable or Highly Viable | Targeted for viability. A-run life-history strategy with very little hatchery influence. Natural river system characteristics. Population provides connectivity between populations in the South Fork, Middle Fork, and Upper Salmon River drainages. |
| MFUMA-s | Middle Fork Salmon River upper mainstem | Intermediate | Moderate B-Run | Viable or Highly Viable | Targeted for viability. Moderate B-run component (15-40%) of population. Very little hatchery influence. Geographic separation from other targeted populations. Natural river system within wilderness boundaries. |
| MFBIG-s | Big, Camas, and Loon Creek | Intermediate | Moderate B-Run | Viable or Highly Viable | Targeted for viability. Moderate B-run component (15-40%) of population with little hatchery influence. Natural river system within wilderness boundaries. |
| SFMAI-s | South Fork Salmon River | Intermediate | High B-Run | Viable or Highly Viable | Targeted for viability. One of two populations in MPG with a strong B-run component (>40% of population). No hatchery influence or effects. Natural river system characteristics. Located at downstream end of MPG. Would provide geographic distribution of viable populations. |
| SFSEC-s | Secesh River | Basic | High B-Run | Viable or Maintained | One of two populations in MPG with a strong B-run (>40% of population). Genetically distinct. No hatchery influence or effects. Natural river system characteristics. |
| SRLSR-s | Little Salmon and Rapid River | Intermediate | A-Run | Viable or Maintained | Population has some hatchery influence, which tends to be out-of-MPG (Dworshak B, Hells Canyon A). There has been little monitoring of the population except Rapid River. |
| Clearwater River | | | | | |
| CRSEL-s | Selway River | Intermediate | High B-Run | Viable or Maintained | Targeted for viability. B-run fish make up >40% of population. Very little hatchery influence. Much of habitat in wilderness protection. |
| CRLOC-s | Lochsa River | Intermediate | High B-Run | Viable or Highly Viable | Targeted for High Viability. B-run fish constitute >40% of population. Very little hatchery influence. Much of habitat in wilderness protection. Area accessible for data collection using current monitoring programs. |
| CRSFC-s | South Fork Clearwater River | Intermediate | High B-Run | Viable or Maintained | High degree of hatchery influence. B-run steelhead make up >40% of population. |
| CRLOL-s | Lolo Creek | Basic | High B-Run | Viable or Highly Viable | B-run steelhead constitute >40% of Lolo Creek population. |
| CRNFC-s | North Fork Clearwater River | Large |  | Not part of recovery scenario | Population is extirpated. |
| CRLMA-s | Clearwater River lower mainstem | Large | Low B-Run | Viable or Highly Viable | Targeted for viability. The only extant Large population. Contains A-run and B-run fish with B-run making up <15% of population. |
| Imnaha River | | | | | |
| IRMAI-s | Imnaha River | Intermediate | A-Run | Highly Viable | Targeted for high viability. Only population in MPG. |
| Grande Ronde River | | | | | |
| GRUMA-s | Grande Ronde River upper mainstem | Large | A-Run | Viable or Highly Viable | Recently tentatively rated as viable. This is the only Large population in the MPG. Currently receives no hatchery releases. |
| GRWAL-s | Wallowa River | Intermediate | A-Run | Viable or Maintained | Wallowa includes multiple core areas and some unique habitat characteristics (e.g. Eagle Cap), but supports a hatchery (with little straying). |
| GRJOS-s | Joseph Creek | Basic | A-Run | Viable, Highly Viable, or Maintained | Recently rated as highly viable. Joseph Creek population has the least hatchery influence. The population contributes to spatial structure in the lower MPG. |
| GRLMT-s | Grande Ronde River lower mainstem tributaries | Intermediate | A-Run | Viable or Maintained | Lower Grande Ronde population receives hatchery releases. The population would contribute to spatial structure in the lower MPG. |
| Hells Canyon | | | | | |
| SNHCT-s | Hells Canyon | NA | NA | Not part of recovery scenario | Do not appear large enough (separate or combined) to support independent population. |
| Lower Snake | | | | | |
| SNASO-s | Asotin Creek | Basic | A-Run | Viable or Highly Viable | Currently rated as Maintained. |
| SNTUC-s | Tucannon River | Intermediate | A-Run | Viable or Highly Viable | Currently rated as Maintained. |

Table . Recovery scenarios for Snake River Spring/Summer Chinook MPGs. Adapted from NOAA (2017).

| MPG & Pop ID | Population Name | Size Category | Adult Life History Type | Role In Scenario | Considerations |
| --- | --- | --- | --- | --- | --- |
| Upper Salmon River | | | | | |
| SRUMA | Salmon River upper mainstem above Redfish Lake | Large | Spring | Viable or Highly Viable | Targeted for high viability. Population is at the geographic end of the ESU and MPG and provides proportional representation of class size. |
| SRVAL | Valley Creek | Basic | Spring | Viable or Highly Viable | Targeted for viability. Historically had larger production than most Basic populations. |
| SRLMA | Salmon River lower mainstem below Redfish Lake | Very Large | Spring / Summer | Maintained |  |
| SRYFS | Yankee Fork Salmon River | Basic | Spring | Maintained | Currently occupied by non-native stock. |
| SREFS | East Fork Salmon River | Large | Spring / Summer | Viable or Highly Viable | Targeted for viability. |
| SRPAH | Pahsimeroi River | Large | Summer | Viable or Highly Viable | Targeted for viability. Only extant population in this MPG with summer life history. |
| SRLEM | Lemhi River | Very Large | Spring | Viable or Highly Viable | Targeted for viability to provide proportional representation of class size. Lemhi historically may have had summer Chinook salmon production. Lemhi provides important connectivity to other MPGs, as a large, downstream population. |
| SRNFS | North Fork Salmon River | Basic | Spring | Maintained | The most downstream population. However, relatively few data are available, and there have been substantial anthropogenic effects on population and habitat. |
| SRPAN | Panther Creek | Intermediate | Spring | Not included in initial recovery strategies[[6]](#footnote-6) | Functionally extirpated, but the only Intermediate population. A large population could be substituted for this population to meet viability criteria. |
| Middle Fork Salmon River | | | | | |
| MFBEA | Bear Valley Creek | Intermediate | Spring | Viable or Highly Viable | Targeted for viability because of historical production potential and opportunity. |
| MFMAR | Marsh Creek | Basic | Spring | Viable or Highly Viable | Targeted for viability due to geographic distribution in MPG and historic production potential. |
| MFSUL | Sulphur Creek | Basic | Spring | Maintained |  |
| MFUMA | Middle Fork Salmon River above Indian Creek | Intermediate | Spring | Viable or Maintained | Upper Middle Fork mainstem is composed of a number of small tributaries (rather than a core, contiguous spawning area). |
| MFLMA | Middle Fork Salmon River below Indian Creek | Basic | Spring / Summer | Maintained |  |
| MFLOO | Loon Creek | Basic | Spring / Summer | Viable or Highly Viable | Targeted for viability because of geographic distribution in MPG and historic production potential. |
| MFCAM | Camas Creek | Basic | Spring | Viable or Maintained |  |
| MFBIG | Big Creek | Large | Spring / Summer | Viable or Highly Viable | Targeted for high viability. The only Large population in this MPG. Supports spring and summer run fish. |
| SRCHA | Chamberlain Creek | Intermediate | Spring | Viable or Highly Viable | Targeted for viability. Significant geographic position provides connectivity between MPGs. Population has unique, apparently persistent genetic characteristics. |
| South Fork Salmon River | | | | | |
| SFSMA | South Fork Salmon River mainstem | Large | Summer | Viable or Highly Viable | Targeted for viability to achieve large-size requirement. |
| SFEFS | East Fork South Fork Salmon River | Large | Summer | Viable or Maintained | Ongoing supplementation exists in this population (Johnson Creek). |
| SFSEC | Secesh River | Intermediate | Summer | Viable or Highly Viable | Targeted for high viability. No supplementation and satisfies Intermediate-size requirement for MPG. |
| SRLSR | Little Salmon River | Intermediate | Spring / Summer | Maintained | Only population with spring/summer life history. Size category is driven by small, adjunct tributaries where the spring life history is represented in the population, although minor. Location outside main drainage. Population is greatly influenced by Rapid River Hatchery production and releases. |
| Grande Ronde / Imnaha River | | | | | |
| IRBSH | Big Sheep Creek | Basic | Spring | Consider for reintroduction as recovery efforts progress | Functionally extirpated. ICTRT recommends that initial recovery efforts focus on extant populations, i.e., the adjacent Imnaha River population, with scoping efforts for re-introduction conducted concurrently. Currently hatchery releases into Big Sheep Creek are from the adjacent Imnaha River population. |
| IRMAI | Imnaha River mainstem | Intermediate | Spring / Summer | Viable or Highly Viable | Only population with spring/summer life history. |
| GRUMA | Grande Ronde River upper mainstem | Large | Spring | Viable or Maintained | Population has the poorest abundance/productivity status of all populations in MPG, would likely require the most improvement to achieve viability. |
| GRCAT | Catherine Creek | Large | Spring | Viable or Highly Viable | Large population, would likely require less improvement than the Upper Grande Ronde population to achieve viability. ICTRT recommends initial focus on Catherine Creek core area (equivalent to Intermediate population). |
| GRLOO | Lookingglass Creek | Basic | Spring | Consider options as ongoing reintroduction efforts progress | Functionally extirpated. ICTRT recommends that initial recovery efforts focus on extant populations. Efforts to re-establish natural production are currently underway. |
| GRMIN | Minam River | Intermediate | Spring | Viable or Highly Viable | Minam R. has little spatial structure or diversity impairment. Wenaha R. and Minam R. populations are currently the most unaffected by hatchery fish. |
| GRLOS | Lostine River | Large | Spring | Viable or Highly Viable | One of the populations that would likely achieve viability with least improvement. |
| GRWEN | Wenaha River | Intermediate | Spring | Viable or Highly Viable | Wenaha R. is most downstream, providing connectivity with other MPGs. Population has little spatial structure or diversity impairment. Wenaha R. and Minam R. populations are currently the most unaffected by hatchery fish. |
| Lower Snake | | | | | |
| SNASO | Asotin Creek | Basic | Spring | Consider for reintroduction as recovery efforts progress | Functionally extirpated. ICTRT recommends that initial recovery efforts focus on extant populations, with scoping efforts for reintroduction conducted concurrently. |
| SNTUC | Tucannon River | Intermediate | Spring | Highly Viable | The only extant population in the MPG. |

# APPENDIX B. Coefficients of Variation for IPTDS-Based Abundance Estimates

Table . Coefficients of variation for IPTDS-based abundance estimates within Snake River steelhead populations for spawn years 2010 – 2023.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pop ID | ‘10 | ‘11 | ‘12 | ‘13 | ‘14 | ‘15 | ‘16 | ‘17 | ‘18 | ‘19 | ‘20 | ‘21 | ‘22 | ‘23 | Mean |
| Salmon River | | | | | | | | | | | | | | |  |
| SRUMA-s | 58.6 | 44.4 | 68.6 | 11.1 | 15.1 | 11.1 | 12.8 | 17.6 | 18.4 | 18.5 | 9.9 | 8.6 | 11.7 | 47.1 | 25.2 |
| SREFS-s | NA | NA | 88.7 | 10.2 | NA | 13.2 | NA | NA | NA | 15.7 | 10.6 | NA | NA | 118.6 | 42.8 |
| SRPAH-s | NA | 44.3 | 52 | NA | 9.5 | 7.8 | 8.2 | 9.7 | 11.4 | 12.2 | 8.9 | 8.9 | 10.4 | 42.7 | 18.8 |
| SRLEM-s | 9.5 | 11.5 | 8.4 | 7.7 | 9.8 | 9.6 | 7.1 | 8.6 | 9.8 | 14.6 | 9.9 | 11.8 | 18 | 17.4 | 11 |
| SRNFS-s | NA | NA | NA | NA | NA | NA | 11 | NA | 47.2 | 12.5 | 11.2 | NA | 20.6 | 15.5 | 19.7 |
| SRPAN-s | NA | NA | NA | NA | NA | NA | NA | NA | 11.3 | 10.7 | 8.6 | 7.6 | 10 | 8.2 | 9.4 |
| SRCHA-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFUMA-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 30.8 | 14.2 | 22.5 | 19.1 | 21.6 |
| MFBIG-s | NA | 9.1 | 16.1 | 7.7 | 14.4 | 16.7 | 12.9 | 30.4 | 9.4 | 13.1 | 15 | 11.4 | 9.1 | 8.1 | 13.3 |
| SFMAI-s | 5 | 4.1 | 5.1 | 5.2 | 9.2 | 4.4 | 5.4 | 5.2 | 8.9 | 8.2 | 12 | 6.1 | 7.1 | 6.6 | 6.6 |
| SFSEC-s | 12.2 | 8.3 | 11.6 | 19.5 | 14.4 | 10.2 | 11.2 | 13 | 17.3 | 23.2 | 25.2 | 19.7 | 18.9 | 15.6 | 15.7 |
| SRLSR-s | 16.4 | 17.5 | 19.9 | 28.1 | 34 | 24.6 | 28.4 | 48.7 | 22.3 | 36.7 | NA | NA | NA | 34.7 | 28.3 |
| Clearwater River | | | | | | | | | | | | | | |  |
| CRSEL-s | NA | NA | NA | NA | NA | NA | NA | NA | 6.9 | 8 | 9.1 | 4.4 | 5.6 | 4.6 | 6.4 |
| CRLOC-s | NA | NA | NA | NA | NA | NA | NA | NA | 6.5 | 7 | 9.5 | 5 | 5.4 | 4.8 | 6.4 |
| CRSFC-s | NA | NA | 5.1 | 6.8 | 9.9 | 6.9 | 6.4 | 6.5 | 15.8 | 11 | 10.8 | 7.4 | 8.1 | 6.9 | 8.5 |
| CRLOL-s | NA | NA | 6.4 | 8 | 10.7 | 7.7 | 8.3 | 10.2 | 9.9 | NA | 13.8 | 7.7 | 11.9 | 9.7 | 9.5 |
| CRNFC-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| CRLMA-s | 5 | 7.5 | 6.1 | 6.5 | 7.6 | 6.6 | 5.6 | 6.9 | 6.6 | 9 | 6.7 | 7.2 | NA | 8.4 | 6.9 |
| Imnaha River | | | | | | | | | | | | | | |  |
| IRMAI-s | NA | 3.3 | 3.2 | 4 | 5.2 | 4.3 | 3.9 | 3.8 | 4.3 | 5.6 | 4.4 | 4.4 | 4.4 | 4.1 | 4.2 |
| Grande Ronde River | | | | | | | | | | | | | | |  |
| GRUMA-s | NA | NA | NA | 4.4 | 6.3 | 4.8 | 4 | 4.8 | 5.3 | 6 | 4.8 | 4 | 7.6 | 5.1 | 5.2 |
| GRWAL-s | NA | NA | NA | NA | 9 | 6.7 | 5.2 | 5.6 | 6.5 | 6.8 | 4.7 | 4.1 | 6.4 | 5.7 | 6.1 |
| GRJOS-s | NA | 4.4 | 3.8 | 4.2 | 5.6 | 4.1 | 4.2 | 4.7 | 4.1 | 5.7 | 5.2 | 4.9 | 7.2 | 6.6 | 5 |
| GRLMT-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | 6.4 | 6.9 | 6.4 | NA | 11.7 | 7.8 |
| Hells Canyon | | | | | | | | | | | | | | |  |
| SNHCT-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lower Snake | | | | | | | | | | | | | | |  |
| SNASO-s | 4.7 | 4.9 | 4.6 | 5.2 | 7.7 | 6.3 | 4.5 | 7 | 6.8 | 12.8 | 8.1 | 6.1 | 6.6 | 5.7 | 6.5 |
| SNTUC-s | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table . Coefficients of variation for IPTDS-based abundance estimates within Snake River spring/summer Chinook salmon populations for spawn years 2010 – 2023.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pop ID | ‘10 | ‘11 | ‘12 | ‘13 | ‘14 | ‘15 | ‘16 | ‘17 | ‘18 | ‘19 | ‘21 | ‘22 | ‘23 | Mean |
| Upper Salmon River | | | | | | | | | | | | | | |
| SRUMA | 42.5 | 54.3 | 37.7 | 7.4 | 6.9 | 9.4 | 7.7 | 15.1 | 25 | 15.8 | 7 | 13.8 | 15.6 | 19.9 |
| SRVAL | 45.3 | 54.9 | 38.5 | 8.3 | 6.4 | 9.1 | 7.8 | 14.3 | 10.6 | 11.2 | 11.3 | 9.2 | 13.1 | 18.5 |
| SRLMA | NA | NA | NA | 5.4 | 4.3 | 5.9 | 3.8 | 10 | 7.6 | 7.9 | 4.4 | 6.2 | NA | 6.2 |
| SRYFS | NA | NA | 37.9 | 8.6 | 10.2 | 16.6 | 11.3 | 17.9 | 13.4 | 20.8 | 18.4 | 22.6 | 18.8 | 17.9 |
| SREFS | 45 | 56 | 40.7 | 9.1 | 8.9 | 17.3 | NA | 39.5 | NA | NA | NA | NA | NA | 30.9 |
| SRPAH | NA | NA | 42.4 | 8.9 | 8.6 | 10.9 | 9.1 | 20.2 | 15.9 | 14 | 10.7 | 9 | 11.4 | 14.6 |
| SRLEM | 19.1 | 9.5 | 15.7 | 6.7 | 6.1 | 6.7 | 8.9 | 11.9 | 9.7 | 7.3 | 7.9 | 4.8 | 7.4 | 9.4 |
| SRNFS | NA | NA | NA | NA | NA | NA | 22.1 | 29.2 | 24.5 | 22.9 | NA | 11.6 | 13.9 | 20.7 |
| SRPAN | NA | NA | NA | NA | NA | NA | NA | NA | 10.2 | 10.1 | 12.1 | 6.9 | 8 | 9.5 |
| Middle Fork Salmon | | | | | | | | | | | | | | |
| MFBEA | NA | NA | NA | NA | NA | 4.8 | 6 | 21.7 | 7.6 | 9.4 | 7.3 | 6.1 | 35.4 | 12.3 |
| MFMAR | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 7.7 | 5.4 | 9.3 | 7.5 |
| MFSUL | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFUMA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFLMA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFLOO | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFCAM | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| MFBIG | NA | 15.2 | 6.8 | 5.4 | 5.8 | 7 | 5.2 | 11.4 | 7.2 | 8.8 | 5.3 | 5.1 | 5.5 | 7.4 |
| SRCHA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| South Fork Salmon | | | | | | | | | | | | | | |
| SFSMA | 4.9 | 3.4 | 4.3 | 5.3 | 4.6 | 8.8 | 4.6 | 7.9 | 7.3 | 8 | 4.5 | 3.5 | 4.6 | 5.5 |
| SFEFS | 8.1 | 6.3 | 6.3 | 5.5 | 5.3 | 9.6 | 4.6 | 7.8 | 6.5 | 7.3 | 5.6 | 4.1 | 5.6 | 6.3 |
| SFSEC | 7.8 | 5.7 | 5.3 | 5.1 | 4.9 | 10 | 5 | 7.2 | 6.7 | 7.1 | 5.2 | 4.2 | 5.2 | 6.1 |
| SRLSR | NA | 14.8 | 49.6 | 46.9 | NA | NA | NA | NA | 46.7 | 51.1 | NA | NA | 47.4 | 42.7 |
| Grande Ronde / Imnaha | | | | | | | | | | | | | | |
| IRBSH | NA | 8.8 | 14.3 | 16.4 | 13.8 | 25.3 | 14.6 | 17.8 | 25.2 | 39.4 | 14.6 | 22.7 | 23.2 | 19.7 |
| IRMAI | NA | 3.7 | 5.2 | 8.8 | 5.9 | 9.1 | 4.3 | 6.1 | 7.6 | 7.6 | 5.9 | 5.8 | 7.2 | 6.4 |
| GRUMA | NA | NA | 14.1 | 31.1 | NA | 11.7 | 16 | 25.4 | 9.4 | 31 | 16.5 | 10.7 | NA | 18.4 |
| GRCAT | 15.2 | 13.2 | 8.9 | 9.7 | 16.4 | 12 | 12.2 | 14.8 | 13.1 | 10.5 | 11.6 | 10 | 13 | 12.4 |
| GRLOO | 29 | 21.8 | 13.1 | 9.7 | 10.9 | 10.6 | 7.7 | 17.6 | 11.8 | 16.3 | 19.6 | 13.8 | 17 | 15.3 |
| GRMIN | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 6.1 | 6.3 | 7.6 | 6.7 |
| GRLOS | NA | NA | NA | NA | NA | NA | NA | NA | NA | 5.3 | 5.1 | 4.5 | NA | 5 |
| GRWEN | NA | NA | NA | NA | NA | NA | NA | NA | NA | 10.6 | 10.8 | 13.5 | NA | 11.7 |
| Lower Snake | | | | | | | | | | | | | | |
| SNASO | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 48.4 | 28.5 | 38.5 |
| SNTUC | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

1. HLIs are intended to communicate complex information in easily understood terms. HLIs for salmon include abundance of wild and hatchery spawners, among others (PNAMP 2009). After NOAA’s monitoring guidance was completed (e.g., Crawford and Rumsey 2009) it was intended that additional HLIs, e.g., to convey life history information, would be identified for salmon and steelhead. [↑](#footnote-ref-1)
2. Examples of adult:adult productivity include adult recruits per adult spawner or lifetime reproductive success. [↑](#footnote-ref-2)
3. Genetic-based effective population size monitoring (e.g., Bowersox et al. 2022, Hargrove et al. 2022, Ackerman et al. 2017) is another potential example of low- or high-resolution monitoring; however, estimates of effective population size or effective number of breeders must be converted to abundance which is still a relatively new and unvalidated technique. [↑](#footnote-ref-3)
4. For spring/summer Chinook salmon, annual adult status and trend data should be collected at high-intensity monitoring for at least one population per run-type (spring versus summer-run) within each MPG (CBCAMW 2010) [↑](#footnote-ref-4)
5. Redd count index transect methods throughout for surveys completed in Idaho in SY2021 were identified in Poole et al. (2022). [↑](#footnote-ref-5)
6. Because the ICTRT (2003) defined the Panther Creek population as functionally extirpated, the population is not included in the initial recovery strategies for achieving a viable MPG or a viable ESU. Thus the recovery plan does not designate a proposed status for this population. The primary recovery function of the population will be to contribute to the abundance, productivity, and spatial structure of the Upper Salmon River MPG and the ESU. However, as more information is gathered about the spring/summer Chinook salmon spawning in Panther Creek, it is possible that NMFS will select Panther Creek as one of the Upper Salmon River populations to reach low risk status as part of the MPG recovery strategy. This determination would then be integrated into the recovery plan. [↑](#footnote-ref-6)