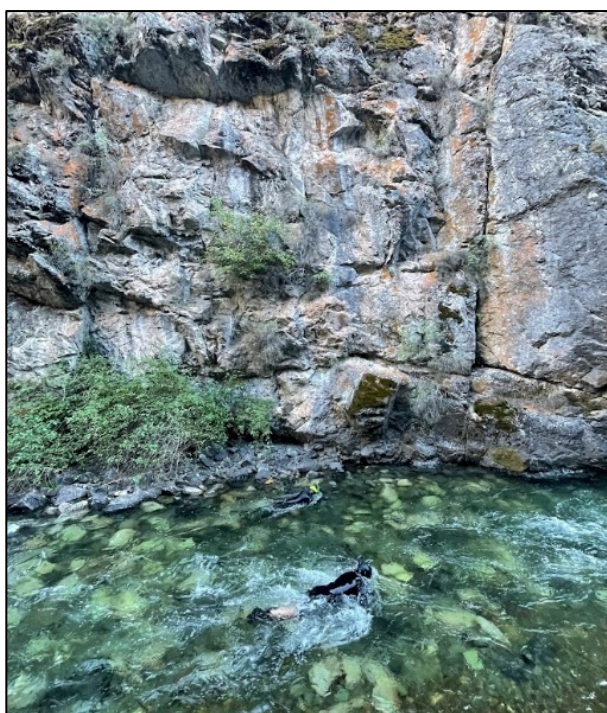




IDAHO ANADROMOUS PARR MONITORING 2022 ANNUAL REPORT



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Idaho Anadromous Parr Monitoring

2022 Annual Report

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ABSTRACT

Idaho Department of Fish and Game (IDFG) monitors occupancy, density, and spatial structure of anadromous salmonid parr and resident fish using snorkel surveys. In this report, we summarize snorkel methods and results from 2022 surveys. Idaho Department of Fish and Game crews surveyed 369 total snorkel transects in the Clearwater and Salmon River basins in 2022. Survey transects are classified as either core ($n = 149$), non-core/resident trend ($n = 37$), or intensive ($n = 183$). No extensive sites were surveyed in 2022. Mean density of steelhead *Oncorhynchus mykiss* across core transects in the Clearwater River basin ($n = 50$) was 3.5 fish per 100m² (SD = 4.0) while mean density of Chinook Salmon *O. tshawytscha* was 1.3 fish per 100m² (SD = 3.6). Steelhead occupied 80% (0.8) and Chinook Salmon occupied 40% (0.4) of sites snorkeled in the Clearwater basin. Mean density of steelhead in the Salmon River basin ($n = 96$) was 1.9 fish per 100m² (SD = 3.9) while mean density of Chinook Salmon was 1.5 fish per 100m² (SD = 3.0). Steelhead occupied 70% (0.7) and Chinook Salmon occupied 50% (0.5) of sites snorkeled in the Salmon Basin. At intensive transects, mean steelhead density was 1.0 fish per 100m² (SD = 1.3; occupancy = 0.5) in the Clearwater River basin, ranging from a low of 0.3 fish per 100m² (SD = 1.0; occupancy = 0.3) in the Potlatch River subbasin to a high of 2.4 fish per 100m² (SD = 2.3; occupancy = 0.9) in the Fish Creek subbasin. Mean Chinook Salmon density in the Clearwater basin was 0.9 fish per 100m² (SD = 2.4; occupancy = 0.1), ranging from zero observed Chinook in the Potlatch and Fish Creek subbasins to 2.6 fish per 100m² (SD = 7.3; occupancy = 0.3) in the Crooked River subbasin. At intensive transects in the Salmon River basin, mean steelhead density was 1.9 fish per 100m² (SD = 2.7; occupancy = 0.6), ranging from a low of 0.8 fish per 100m² (SD = 1.7 fish per 100m²) in the Marsh Creek subbasin to a high of 2.8 fish per 100m² (SD = 2.6 fish per 100m²) in the Rapid River subbasin. Mean Chinook Salmon density in the Salmon River basin was 0.9 fish per 100m² (SD = 2.1; occupancy = 0.3), ranging from a low of <0.1 fish per 100m² (SD = 0.1; occupancy = 0.1) in the North Fork Salmon River subbasin to a high of 2.0 fish per 100m² (SD = 4.1; occupancy = 0.5) in the South Fork Salmon River subbasin. Mean detection efficiency for juvenile steelhead across 14 mark-resight surveys in 2022 was 34.9%, similar to the 5-year mean of 38.0% (2016-2021). Routine snorkel surveys of core transects will allow us to continue to monitor trends in parr density and occupancy.

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INTRODUCTION

Populations of Chinook Salmon *Oncorhynchus tshawytscha* and steelhead *O. mykiss* in the Snake River basin declined substantially following the construction of hydroelectric dams in the Snake and Columbia rivers. Snake River steelhead were listed as threatened under the ESA in 1997 (Busby et al. 1996). Within the Snake River basin steelhead distinct population segment (DPS), the Interior Columbia Basin Technical Recovery Team (ICBTRT) delineated six MPGs: Lower Snake River, Grande Ronde River, Imnaha River, Clearwater River, Salmon River, and Hells Canyon Tributaries (ICBTRT 2003, 2005). However, the Hells Canyon MPG is considered extirpated (Table 1). Snake River Chinook Salmon were listed as threatened in 1992 under the Endangered Species Act (ESA). Within the Snake River Chinook Salmon evolutionarily significant unit (ESU), there are seven major population groups (MPGs): Lower Snake River, Grande Ronde/Imnaha rivers, South Fork Salmon River, Middle Fork Salmon River, Upper Salmon River, Dry Clearwater, and the Wet Clearwater (Table 2). However, the Dry Clearwater and the Wet Clearwater MPGs were re-established with out-of-basin stocks after extirpation and are not listed under the ESA. A total of 28 extant demographically independent populations of Chinook Salmon have been identified.

The Idaho Department of Fish and Game (IDFG) anadromous fish program's long-range goal is to rebuild and preserve Idaho's Chinook Salmon and steelhead runs to healthy and harvestable levels to provide benefits for all users (IDFG 2019). Key objectives to achieve the management goal are: 1) maintain genetic and life history diversity of naturally occurring and hatchery produced fish; 2) rebuild naturally reproducing populations of anadromous fish to utilize existing and potential habitat at an optimal level; 3) improve overall life cycle survival sufficient for delisting and recovery by addressing key limiting factors identified in all of the "H's": hydropower, habitat, harvest, and hatchery; 4) allow consumptive harvest through sport and treaty fishing; and 5) coordinate Pacific Northwest regional management with Idaho anadromous management to ensure achievement of Idaho management objectives and the long-range program goal (IDFG 2019). Management to achieve these goals requires an understanding of how salmonid populations function as well as periodic status assessments (McElhany et al. 2000). Specific data on some Snake River steelhead and Chinook Salmon populations were identified as lacking in 2003, particularly key parameters such as abundance, age composition, genetic diversity, recruits per spawner, and survival rates (ICBTRT 2003). The department continues to work to fill these gaps through pertinent data collection on natural-origin abundance and spawning escapements, but more information on individual populations could improve future management and status assessments (Ford 2011, 2022).

Snorkel surveys are widely used for monitoring fish populations because they are a versatile and cost-effective technique. Snorkel surveys can be efficient where environmental conditions limit the effectiveness of other techniques, such as electrofishing (Schill and Griffith 1984; Bonneau et al. 1995). Gear and personnel requirements are comparatively modest, so logistical demands are reduced, and remote locations become feasible to sample (Hankin and Reeves 1988; Thurow 1994). Counts taken through underwater observations are non-lethal and less intrusive than other field methods and are an appropriate means to monitor fishes listed under the Endangered Species Act (e.g., Chinook Salmon, steelhead, and Bull Trout *Salvelinus confluentus*). In addition, steelhead spawning cannot be directly assessed in many Idaho streams in an efficient manner because springtime water conditions make it difficult to observe fish or redds. Therefore, snorkel survey data describing juvenile densities and distribution are particularly important for steelhead.

Freshwater salmonid production can fluctuate greatly between years. Snorkel surveys provide information related to the density (relative abundance), distribution, and historical trends of Idaho's wild Chinook Salmon and steelhead populations. Snorkel survey data from sites that are distributed probabilistically across the landscape can also be used to address ESA reporting needs, identify critical habitat, and help prioritize future restoration actions. Valuable abundance and distribution information on resident salmonids are also collected during monitoring (Copeland and Meyer 2011); for example, approximately 20 surveys per year are specifically conducted to monitor resident salmonids, with funding from Dingell-Johnson Act and IDFG license funds (Appendix A3).

The snorkel program addresses three specific questions relative to population status and the effectiveness of our monitoring techniques.

1. How is relative density of anadromous salmonid parr changing over time?
2. What is the distribution and relative abundance of steelhead and Chinook Salmon within the populations identified in the recovery plans?
3. What major and minor spawning habitats do rearing juvenile anadromous salmonids occupy?

In this report, we summarize the results of snorkel surveys conducted by IDFG in anadromous waters during 2022 and compare them to prior years.

METHODS

Snorkel sites are predetermined as areas where transects are established. These areas are typically chosen using either historic knowledge of high-quality habitat deemed by experienced biologists (core sites) or from a probabilistic design using GIS (intensive and extensive sites). A transect is then established at the site and is defined as the stretch of stream in which records of occurrences or counts of fish are conducted. A transect will have upstream and downstream boundaries located at hydraulic controls - defined as any definite change in stream gradient that spans the entire wetted width - and are typically 100 m in length (Apperson et al. 2015).

Survey transects for 2022 were selected based on the Idaho Anadromous Parr Monitoring 2021 Annual Report Appendices A1-A3 survey schedules (Putnam et al. 2022). Transects selected for 2023 will be based upon Appendices A1-A3 survey schedules in this report. This appendix contains the transects not completed in recent years that should be prioritized for survey in 2023, such as South Fork Salmon River Chamberlain basin sites.

We describe here the three different types of surveys used to monitor salmonid parr population status and the effectiveness of our snorkel technique: 1) Trend surveys, which consist of core, noncore, and resident transects; 2) probabilistic surveys, which consist of intensive and extensive transects; and 3) detection probability surveys, or mark-resights.

Trend Surveys

Core

Core transects are subsets of long-established transects that were subjectively selected because they represent suitable Chinook Salmon and steelhead habitat. These transects were originally developed by the General Parr Monitoring (GPM) program, which was a focused effort by IDFG to measure the juvenile response of wild/natural anadromous populations to off-site mitigation habitat actions and improvements (Rich et al. 1990). Core trend transects were defined as locations where at least one survey had been conducted within each 5-year period during 1984-2011. Core trend transects also included corridor surveys (see “Snorkel Methods”) in the Middle Fork Salmon River, which had been completed for many consecutive years, and therefore were deemed important to IDFG management programs. Core transect data are used to evaluate how the abundance of anadromous salmonid parr is changing over time. We identified 218 core trend transects (Stiefel et al. 2014), but two were subsequently removed from the list because of transect issues. Johns Creek 1/2 was removed because a log jam covered the transect area and changed the adjacent hydrology. Crooked River 4/MEANDER1 was removed because the river section was moved during a habitat restoration project. Based on logistical difficulty, core transects are surveyed annually, biennially, or triennially during the months of June, July, and August. Regular monitoring of these transects provides the “core” of Idaho’s monitoring of the abundance trend of juvenile anadromous salmonids. These data are summarized by steelhead major population group (i.e., Clearwater, Salmon, and Hells Canyon).

Non-core

Non-core survey panels are performed for other purposes as deemed necessary for IDFG regional fishery management needs. Non-core transects are surveyed opportunistically. They are surveyed as time allows and are not necessarily surveyed on a consistent basis. As such, they are not relied on to provide statewide status and trend information for Chinook Salmon or steelhead.

Resident

Resident snorkel survey panels are conducted to address monitoring needs for resident salmonids (e.g., Westslope Cutthroat Trout, Bull Trout, and Mountain Whitefish). These surveys also provide valuable anadromous fishes data. Resident transects are surveyed opportunistically. They are surveyed as time allows and are not necessarily surveyed on a consistent basis. As such, they are not relied on to provide statewide status and trend information for Chinook Salmon or steelhead.

Probabilistic Surveys (GRTS)

In 2007, a probabilistic approach was adopted for establishing transects to obtain a spatially-balanced and representative set of sample transects. A generalized random-tessellation stratified (GRTS) design (Stevens and Olsen 2004) was used to obtain estimates of steelhead parr density at the population scale. The GRTS design randomly selects a suite of transects that are spatially distributed evenly across the available distribution of Chinook Salmon and steelhead parr (Stevens and Olsen 2004). Crews are provided an ordered list of transects “such that each successive site on the list maintains the spatial balance of the full set of sites in the sample” (Stevens and Olsen 2004). The crew then surveys or attempts to survey higher priority transects

before lower priority transects are surveyed. Extra transects, up to two times the sample goals, are included on the transect list in case some sites cannot be sampled.

Intensive

Panels of intensive transects were developed to evaluate the relationship between fish density from snorkel surveys and juvenile steelhead emigrant abundance derived from rotary screw traps over several years. Intensive panel surveys are generally conducted annually, upstream of associated screw traps, and generally consist of at least 20 transects. In 2022, we continued monitoring the Potlatch River (lower Clearwater River steelhead population), Fish Creek (Lochsa River steelhead population), Crooked River (South Fork Clearwater River steelhead population), Marsh Creek (Upper Middle Fork Salmon River steelhead population), North Fork Salmon River (North Fork Salmon River steelhead population), South Fork Salmon River (South Fork Salmon River steelhead population), and Rapid River (Little Salmon River steelhead population).

In this report we utilized data generated from intensive transect surveys to develop maps displaying the density and distribution of steelhead and Chinook Salmon in basins where rotary screw traps are operated (Figures 7-18). Resulting maps are at a population scale finer than extensive transects, which generally followed ICBTRT's (2003, 2005) steelhead population delineations.

Extensive

Extensive snorkel survey panels were established to better inform local management and ESA status assessments of occupancy and distribution information from individual steelhead population and spawning aggregates as defined by the ICBTRT (2003, 2005; Table 1). Extensive panel transects can be utilized for opportunistic events or for special data needs such as visiting watersheds with sparse data, providing recent data to inform future restoration or watershed status assessment, or to evaluate post fire conditions. Extensive panel transects were selected based on need and crew availability. Because late spring runoff and poor visibility delayed the 2022 snorkel season, only higher prioritized Core and Intensive transects were surveyed. No extensive panel transects were surveyed in 2022.

Detection Probability Surveys (Mark-Resight)

To assess observation bias during snorkel surveys, field crews implemented a mark-resight methodology to estimate detection efficiency of steelhead parr and Westslope Cutthroat Trout *Oncorhynchus clarkii*, with a program goal of performing detectability surveys in 10% of transects annually. Mark-resight survey transects are chosen at the snorkel crew leader's discretion based on time constraints, ability to catch a minimum of 15 fish for marking (with an ideal sample size of 30 marked fish), and water conditions. A protocol modified from Thurow et al. (2006) was designed to estimate detection probability through observation of individuals marked with a caudal fin clip (Apperson et al. 2015). Because Thurow et al. (2006) found that steelhead and Westslope Cutthroat Trout had the same detection efficiency, we evaluate the observation efficiency of snorkeling for juvenile steelhead and/or Cutthroat Trout. Therefore, detectability reported here may include observation of steelhead parr or both species combined at a subset of transects.

Detection probability is calculated as the number of marked fish observed in the 100 m target transect and oversample reaches (50 m sections on the upstream and downstream side of

the target transect), divided by number of fish marked. We assume limited movement; however, we include all marked fish observed in the oversample reaches because we do not use block nets to create an impassable barrier on the upstream and downstream margins of the target transect. Therefore, potential movement of marked fish from the target reach biases the estimate downward if they are not included. Including marked fish from the oversample reaches in the calculation increases precision because each marked fish is treated as an independent trial; seen or not seen.

Snorkel Methods

The number of snorkelers for a survey varies depending on four factors: 1) the width of the stream channel, 2) underwater visibility, 3) prevalence of physical obstructions in a transect, and 4) the number of snorkelers available. Snorkelers proceed slowly upstream, avoiding sudden movements. A designated data recorder follows the snorkelers from a central position downstream and directs the survey by making sure all areas of the site are surveyed, keeping snorkelers in formation, and adjusting the number of snorkelers in the site as stream width changes. If a site is not conducive to snorkeling in an upstream direction due to excessive depth and/or velocity, the transect is surveyed by floating from the upstream boundary to the downstream boundary (see *Corridor Surveys*; Apperson et al. 2015). Coordination is ongoing between adjacent snorkelers as site width changes, fish move across lanes, or large schools of fish span multiple lanes.

Unless otherwise noted, six salmonid species were observed in all major basins: Chinook Salmon, Brook Trout *Salvelinus fontinalis*, Bull Trout, Mountain Whitefish *Prosopium williamsoni*, steelhead, and Westslope Cutthroat Trout. All salmonids are counted by species. Trout and char are reported by 1-inch size classes and salmon species are reported by age, either as young-of-the-year ("zeros") or yearlings ("ones"). Trout fry (*Oncorhynchus* spp less than 75 mm) are not distinguishable to the species level and are recorded separately. Any non-salmonid fishes, amphibians, and bivalve invertebrates are recorded if present and identified to the lowest taxon possible without compromising the survey of salmonid abundance.

Transect length, wetted width, elevation, water temperature, visibility, and percent habitat type (pocket water, riffle, run, pool, glide) are recorded for each transect. Additional habitat data is collected for detectability surveys. Specific methods used to conduct fish abundance surveys by snorkeling are detailed by Apperson et al. (2015) and that document should be used as the primary methods reference for this report. Exceptions or additions to protocols outlined in Apperson et al. (2015) are described in this report.

Analytical Methods

Snorkel data from all survey types are stored and managed by IDFG in the Lakes and Streams Database (LSDB) and are accessible with IDFG permission from the Idaho Fish and Wildlife Information System (IFWIS; <https://idfg.idaho.gov/ifwis/fishsurvey>). Data is originally collected on individual snorkelers' PVC arm cuffs or called out directly to the data recorder and compiled onto a paper data sheet before leaving a site. Data sheets are organized by subbasin and scanned into the IDFG file system as the subbasin is completed. Data is keypunched into the LSDB where it is archived and accessible for future analysis. All data is checked for accuracy and completeness at multiple stages: transcription from arm cuff to datasheet, keypunch from datasheet to LSDB, additional LSDB review by crew leads, and when data is pulled from LSDB for annual analysis.

Densities for all species are expressed as number of fish/100 m² in each transect. Transect area where the entire stream width is surveyed is calculated by measuring a minimum of three wetted widths, including transect start and end points. The average wetted width is then multiplied by total transect length to calculate the transect area (Apperson et al. 2015). Transect area for reaches where entire stream width cannot be surveyed (Corridor Surveys; Apperson et al. 2015) is calculated by measuring visible corridor width with a secchi disk and multiplying by the number of participating snorkelers.

Occupancy of steelhead and Chinook Salmon is calculated for transects based on presence and absence of each species. This metric refers to the proportion of transects in which a specific species was encountered in comparison to the total number of transects surveyed in that basin. Standard deviation is calculated for occupancy by treating occupancy as a binomial random variable and multiplying the probability that a transect is occupied by the probability that it is not and dividing by the sample size. For the purposes of this report, it provides a metric that describes the amount of available habitat occupied by Chinook Salmon and steelhead.

$$SD = P(t_i=1) * P(t_i=0)^{-1}/n,$$

where $P(t_i=1)$ is the probability that a transect is occupied by the species of interest, $P(t_i=0)$ is the probability that a transect is not occupied by the species of interest, and n is the sample size.

Trend data since 2012 (excluding 2020 due to the Covid-19 pandemic), including mean fish densities and standard deviations, for core transects in the Clearwater and Salmon river basins are reported, along with the respective 5-year running mean and standard deviation for comparison.

Maps are provided to better visualize anadromous parr distribution and relative abundance of Chinook Salmon and steelhead at transects in each subbasin. These maps were drafted using ArcMap 10.8 to display the distribution of intensive GRTS survey transects. Intensive surveys were conducted in the Clearwater basin on the Potlatch River, Fish Creek, and Crooked River; and in the Salmon River basin on Rapid River, South Fork Salmon River, Marsh Creek, and North Fork Salmon River. No extensive surveys were performed in either river basin due to time constraints, high water, and wildfires inhibiting site access and reducing visibility. Graduated symbols were used to illustrate densities, which were classified using defined intervals based on species distribution and range. The intervals were: 0.00, .001–2.49, 2.50–4.99, 5.00–9.99, 1–14.99, 15.00–19.99, 2–24.99 fish observed/100m².

RESULTS

During 2022, a total of 369 snorkel surveys were completed. Fifty-two additional transects were not surveyed (14 core, 5 non-core, 17 intensive, and 14 resident sites) due to high water, limited site access, and reduced visibility. Consequently, no extensive sites were surveyed due to prioritization of core trend and GRTS intensive sites. Detailed results for surveyed transects are expansive and are therefore presented in appendices (Appendix B for core trend transects, C for non-core trend and resident trend transects, and D for intensive transects). Density and distribution maps were provided for intensive snorkel surveys completed in 2022 (Figures 7-18).

Trend Surveys

Core

A total of 41 core trend transects were surveyed in the Clearwater River basin in 2022. Mean steelhead density was 2.9 fish/100 m² (SD = 3.7; Figure 1; Appendix B1) and mean Chinook Salmon density was 1.5 fish/100 m² (SD = 3.9; Figure 2; Appendix B1). Mean steelhead density in 2022 was 193.6% of the five-year mean (2018–2022; 1.5 fish/100 m²; SD = 0.9). Mean Chinook Salmon density was 87.3% of the 2018–2022 mean (1.7 fish/100 m²; SD = 1.7). Steelhead occupancy was 0.8 and Chinook Salmon occupancy was 0.4 for Clearwater River basin core trend transects.

A total of 104 core trend transects were surveyed in the Salmon River basin in 2022. Mean steelhead density was 2.2 fish/100 m² (SD = 4.0; Figure 1; Appendix B2) and mean Chinook Salmon density was 1.4 fish/100 m² (SD = 2.9; Figure 2; Appendix B2). Mean steelhead density in 2022 was 114.9% of the five-year mean (2018–2022; 1.9 fish/100 m²; SD = 0.3). Mean Chinook Salmon density in 2022 was 67.5% of the 5-year mean (2.1 fish/100 m²; SD = 0.9). Steelhead occupancy was 0.7 and Chinook Salmon occupancy was 0.5 for Salmon River basin core trend transects.

Two core trend transects were surveyed in the Hells Canyon portion of the Snake River basin, Idaho in 2022. Mean steelhead density was 9.4 fish/100 m² (SD = 4.2; Figure 1; Appendix B2) and mean Chinook Salmon density was 1.2 fish/100 m² (SD = 0.8; Figure 2; Appendix B2). These transects were surveyed five times between 2013 and 2021 (2013, 2014, 2015, 2018, 2021). Mean steelhead density in 2022 was 53.9% of the 5-year mean (17.4 fish/100 m²; SD = 5.1). Mean Chinook Salmon density in 2022 was 38.6% of the 5-year mean (3.1 fish/100 m²; SD = 2.8). Steelhead and Chinook Salmon occupancy was 1.0 for the Hells Canyon core trend transects. Two additional Hells Canyon sites were visited in Granite Creek during 2022. They were not surveyed because dense stands of poison ivy block access to the transects.

Non-core and Resident

In the Clearwater River basin, 12 non-core trend transects were surveyed during 2022 (Appendix C1). Mean steelhead density was 2.1 fish/100 m² (SD = 3.2) and occupancy was 0.8. Chinook Salmon were not observed in Clearwater River basin non-core transects in 2022.

In the Salmon River basin, 17 non-core trend transects were surveyed during 2022 (Appendix C2). Mean steelhead density was 3.1 fish/100 m² (SD = 3.8) and mean Chinook Salmon density was 0.3 fish/100 m² (SD = 0.8). Steelhead occupancy was 0.9 and Chinook Salmon occupancy was 0.3 for Salmon River basin non-core trend transects.

A total of 8 resident trend transects were surveyed in 2022: four transects in the Clearwater River basin (Appendix C3) and four in the Salmon River basin (Appendix C4). In the Clearwater River basin, mean steelhead density was 3.4 fish/100 m² (SD = 0.8) and mean Chinook Salmon density was 1.3 fish/100 m² (SD = 1.9). Steelhead occupancy was 1.0 and Chinook Salmon occupancy was 0.5. In the Salmon River basin, mean steelhead density was 1.7 fish/100 m² (SD = 1.5) and mean Chinook Salmon density was 2.8 fish/100 m² (SD = 3.5). Steelhead occupancy was 0.8 and Chinook Salmon occupancy was 0.5.

Probabilistic Surveys (GRTS)

Intensive

In the Potlatch River basin, 42 intensive GRTS transects were surveyed during 2022 (Appendix D1; Figure 11). Mean steelhead density in these transects was 0.4 fish/100 m² (SD = 1.1) with an occupancy of 0.3 (Figures 3 and 4). Chinook Salmon were not observed in the Potlatch River basin in 2022.

In the Fish Creek basin, 21 intensive GRTS transects were surveyed during 2022 (Appendix D2; Figure 12). Mean steelhead density was 2.4 fish/100 m² (SD = 2.3), with an occupancy of 0.9 (Figures 3 and 4). Chinook Salmon were not observed in the Fish Creek basin in 2022.

In the Crooked River basin, 19 intensive GRTS transects were surveyed during 2022 (Appendix D3; Figures 13 and 14). Mean steelhead density was 0.4 fish/100 m² (SD = 0.6), with an occupancy of 0.4. Mean Chinook Salmon density was 2.6 fish/100 m² (SD = 7.3) with an occupancy of 0.3 (Figures 3 and 4).

In the Rapid River basin, 20 intensive GRTS transects were surveyed during 2022 (Appendix D4; Figures 15 and 16). Mean steelhead density was 2.8 fish/100 m² (SD = 2.6) with an occupancy of 0.7. Mean Chinook Salmon density was 0.5 fish/100 m² (SD = 1.5) with an occupancy of 0.4 (Figures 5 and 6).

In the South Fork Salmon River basin, 30 intensive GRTS transects were surveyed during 2022 (Appendix D5; Figures 17 and 18). Mean steelhead density was 2.2 fish/100 m² (SD = 3.8) with an occupancy of 0.7. Mean Chinook Salmon density was 2.0 fish/100 m² (SD = 4.1) with an occupancy of 0.5 (Figures 5 and 6).

In the North Fork Salmon River basin, 28 intensive GRTS transects were surveyed during 2022 (Appendix D6; Figures 19 and 20). Mean steelhead density was 1.9 fish/100 m² (SD = 2.8) with an occupancy of 0.6. Mean Chinook Salmon density was <0.1 fish/100 m² (SD = 0.1) with an occupancy of 0.1 (Figures 5 and 6).

In the Marsh Creek basin, 23 intensive GRTS transects were surveyed during 2022 (Appendix D7; Figures 21 and 22). Mean steelhead density was 0.8 fish/100 m² (SD = 1.7) with an occupancy of 0.3. Mean Chinook Salmon density was 1.0 fish/100 m² (SD = 2.8) with an occupancy of 0.3 (Figures 5 and 6).

Extensive

No extensive transects were surveyed during the 2022 snorkel season.

Detection Probability Surveys (Mark-Resight)

In 2022, we conducted mark-resight studies at 14 transects to assess detection probability for steelhead. Crews marked 381 fish (279 steelhead and 102 Westslope Cutthroat Trout) and detected 133 of the marked fish. Transect detection probabilities in 2022 varied from 7% to 81% with a mean of 35% (SD = 19.0; Table 3).

DISCUSSION

In 2022, early spring conditions were cool and late spring runoff produced high flows and low visibility at many transects. Later in the season, fires and road conditions restricted access to many survey locations. These conditions, combined with prioritization of core trend and GRTS intensive sites, ultimately prevented completion of multiple core, non-core, resident, and intensive sites, and all opportunistic extensive sites. Surveys missed at core site locations during the 2022 season will be prioritized for the 2023 season.

Snorkel survey data are used for many purposes, ranging from reporting spatial distribution of salmonids for ESA status reviews (Copeland et al. 2015, Poole et al 2020) to assessing habitat prioritization and how anthropogenic modifications to salmonid habitat may affect threatened populations. For example, in the East Fork Potlatch River, maps have shown a gradient of steelhead densities, with greater densities and occupancy higher in the watershed. This has led to prioritizing habitat restoration work in the lower East Fork Potlatch River watershed, with the goal of restoring densities to that of the upper reaches (Potlatch Implementation Group 2019). Idaho Department of Fish & Game's core snorkel survey dataset is the most spatially and temporally robust information on salmonid distribution and abundance in the state and should continue to be surveyed. Outside of their primary purpose, other survey types (e.g. intensive surveys) may serve as ancillary data for gaps in the spatial and temporal extent of core surveys, as methods are standardized across survey types.

Although cost-effective and spatially extensive, snorkel data lack accuracy and error is difficult to measure. Density data from core snorkel surveys show trends assumed to represent the population, but fish densities should be viewed as minimum density within a transect (as opposed to an absolute density). Gross trend information from snorkeling can serve as an indicator for assessing fish populations, but because bias and error is difficult to account for, snorkeling data should not be extrapolated or interpolated to areas outside of transects. Observer error and bias for snorkeling efforts in Idaho have yet to be fully analyzed, but the recently concluded collection of mark-resight data, local studies (Hand et al. 2022), and studies from other regions (Thurrow et al. 2006, Korman et al. 2011, Staton et al. 2022) will help inform these areas of uncertainty. These studies propose fish species, body size, water visibility, habitat type (riffle, run, pool), and sampling method as variables most influential to snorkel detectability, but intra-annual variables such as flow, temperature, and fish behavior can also affect accuracy in observing fish.

In an attempt to account for site-specific error and inter- and intra-annual variability in snorkel data, mark-resight surveys began in 2007 at select transects. In 2019, a more standardized approach was adopted, and crews (1) began conducting mark-resights at similar times and locations each year, (2) attempted to conduct a greater number of resights each year, and (3) spread resight surveys throughout the season to account for varying water levels and a crews' experience (Roth et al 2019). Despite this approach, crews were continually unable to mark enough fish and survey enough transects to meet sampling recommendations. With the continual decline of juvenile steelhead abundances in survey locations, lower numbers of marked fish could lead to major changes in sightability based on seeing or not seeing a single fish, leaving a large potential for error. Mark-resight surveys require substantial time and labor but are important when considering bias and accuracy of snorkel survey data. These surveys should be suspended, and current efforts should be allocated to analyzing existing sightability data to determine its applicability for modeling detectability at various snorkel locations to reduce survey biases.

Annual occupancy data from snorkel surveys is one of our best ongoing metrics for evaluating juvenile anadromous salmonid spatial structure, especially for steelhead. However, occupancy should be considered a coarse metric that depicts large areas distilled to a single proportion. The distribution maps presented in Figures 7-18 provide a landscape level perspective of the areas inhabited by steelhead and Chinook Salmon in Idaho as well as their relative densities. Occupancy information is useful for programs prioritizing habitat restoration projects for Columbia basin anadromous fish.

Of IDFG's current snorkel transect types (core, non-core, resident, intensive, and extensive), core snorkel transects provide our longest, most consistent data series to track fish density and occupancy changes over time. Mean steelhead density in core transects increased in the Clearwater basin from 2021 to 2022 but remains low compared to historic densities in both the Clearwater and Salmon River basins. Chinook Salmon densities in core transects decreased in 2022, falling below the 5-year mean for both Clearwater and Salmon River basins, after experiencing a slight but steady increase in density since 2018. Running five-year means continue to gradually decline for both basins and species.

Intensive survey panels were established in 2007 to determine if a relationship exists between juvenile densities from snorkeling and emigration abundance upstream of rotary screw traps. The relationship between juvenile densities from snorkeling and emigration abundance estimates from screw traps was investigated by Poole and Copeland (in review) and snorkel surveys will no longer be conducted at intensive locations for this purpose.

Snorkel surveys are a useful tool to track relative density and occupancy at a landscape scale over time. Routine snorkel surveys of core transects will provide continuous monitoring of density and occupancy trends, while other survey types supplement that data with statewide distribution, relationships to other juvenile data collection methods (rotary screw traps), and detectability estimates.

RECOMMENDATIONS

1. Maintain long-term time series of core surveys.
2. Conclude GRTS intensive survey efforts and analysis and re-direct those efforts toward GRTS extensive surveys to expand data on steelhead distribution, occupancy, and density across the landscape.
3. Provide information for ESA status reviews and help visualize fish on the landscape, create distribution maps based on extensive panels to describe the spatial structure of steelhead, Chinook Salmon, and other salmonids in Idaho, and specifically for steelhead, analyze and report distribution and density of parr by major and minor spawning aggregations (MSAs).
4. Suspend mark-resight survey efforts and assess current survey design efficiency, factors influencing sightability, and overall applicability of mark-resight survey data to snorkel density estimates.

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TABLES

Table 1. Major population groups and independent populations within the Snake River steelhead distinct population segment (DPS) (ESU; ICBTRT 2003, 2005, 2009; Ford 2011, 2015; NMFS 2011, 2016).

Snake River steelhead DPS	
Major population group	Population name
Lower Snake River	1. Tucannon River 2. Asotin Creek
Grande Ronde River	3. Lower Grande Ronde River 4. Joseph Creek 5. Wallowa River 6. Upper Grande Ronde River
Imnaha River	7. Imnaha River
Clearwater River	8. Lower Clearwater River
	9. North Fork Clearwater River (extirpated)
	10. Lolo Creek
	11. Lochsa River
	12. Selway River
Salmon River	13. South Fork Clearwater River
	14. Little Salmon and Rapid Rivers
	15. Chamberlain Creek
	16. South Fork Salmon River
	17. Secesh River
	18. Panther Creek
	19. Lower Middle Fork Salmon River
	20. Upper Middle Fork Salmon River
	21. North Fork Salmon River
	22. Lemhi River
	23. Pahsimeroi River
	24. East Fork Salmon River
	25. Upper Salmon River
Hells Canyon Tributaries (extirpated) ^a	

^a Reintroduced fish may exist in some extirpated areas except the North Fork Clearwater River.

Table 2. Major population groups and independent populations within the Snake River spring-summer Chinook Salmon evolutionary significant unit (ESU; ICBTRT 2003, 2005, 2009; Ford 2011, 2015; NMFS 2011, 2016).

Snake River spring-summer Chinook Salmon ESU	
Major population group	Population name
Lower Snake River	1. Tucannon River
	2. Asotin Creek (extirpated) ^a
Grande Ronde/Imnaha Rivers	3. Wenaha River
	4. Lostine River
	5. Minam River
	6. Catherine Creek
	7. Upper Grande Ronde River
	8. Imnaha River
South Fork Salmon River	9. Big Sheep Creek (extirpated) ^a
	10. Lookingglass Creek (extirpated) ^a
	11. Little Salmon River
	12. South Fork Salmon River Mainstem
	13. Secesh River
	14. East Fork South Fork Salmon River
Middle Fork Salmon River	15. Chamberlain Creek
	16. Middle Fork Salmon River below Indian Creek
	17. Big Creek
	18. Camas Creek
	19. Loon Creek
	20. Middle Fork Salmon River above and including Indian Creek
	21. Sulphur Creek
	22. Bear Valley Creek
Upper Salmon River	23. Marsh Creek
	24. Panther Creek (extirpated) ^a
	25. North Fork Salmon River
	26. Lemhi River
	27. Salmon River Lower Mainstem below Redfish Lake
	28. Pahsimeroi River
	29. East Fork Salmon River
	30. Yankee Fork Salmon River
Dry Clearwater River (extirpated) ^a	31. Valley Creek
	32. Salmon River Upper Mainstem above Redfish Lake
	33. Potlatch River (extirpated) ^a
	34. Lapwai Creek (extirpated) ^a
Wet Clearwater River (extirpated) ^a	35. Lawyer Creek (extirpated) ^a
	36. Upper South Fork Clearwater River (extirpated) ^a
	37. Lower North Fork Clearwater River (extirpated)
	38. Upper North Fork Clearwater River (extirpated)
	39. Lolo Creek (extirpated) ^a
	40. Lochsa River (extirpated) ^a
	41. Meadow Creek (extirpated) ^a
	42. Moose Creek (extirpated) ^a
	43. Upper Selway River (extirpated) ^a

^a Reintroduced fish may exist in some extirpated areas except the North Fork Clearwater River.

Table 3. Mark-resight snorkel surveys completed in 2022. Both marked steelhead and juvenile Westslope Cutthroat Trout were included in counts. An asterisk denotes surveys that included Cutthroat Trout.

Stream	Transect	Habitat type	Number of marked fish	Number of marked fish observed	Percent of marked fish observed	Visibility (m)	Water temperature (°C)
Crooked Fork Creek	Russian Creek	Riffle/Run/Pool	24*	9	38%	4.1	17.0
East Fork of South Fork Salmon River	Resight	Riffle/Pocket Water/Run	28*	9	32%	1.8	10
Fish Creek	41666	Pocket water/Run	31*	25	81%	2.6	19.0
Fish Creek	Culvert	Riffle/Run	31*	11	35%	3.6	19.0
John's Creek	John's Falls	Riffle/Run	27	14	52%	3.0	19.0
John's Creek	Resight 1	Riffle/Run	30*	8	27%	3.7	19.0
Mill Creek	73890	Riffle/Pool/Run	30*	8	27%	1.7	20.0
Mill Creek	2 mile Bridge	Riffle	29*	16	55%	1.7	20.0
Newsome Creek	80034	Run/Riffle/Pool	30*	9	30%	1.1	22.0
Newsome Creek	440A Bridge	Riffle/Run	33*	9	27%	2.9	19.0
Newsome Creek	Flying Fish	Pocket	31*	2	7%	1.4	10.8
Newsome Creek	Watergate	Run	19*	6	32%	1.7	12.0
Post Office Creek	Above Bridge	Pocket	20*	5	25%	4.8	13.5
Rapid River	193426	Riffle/Run	18	2	11%	2.7	10.0
Total			381	133	35%		

FIGURES

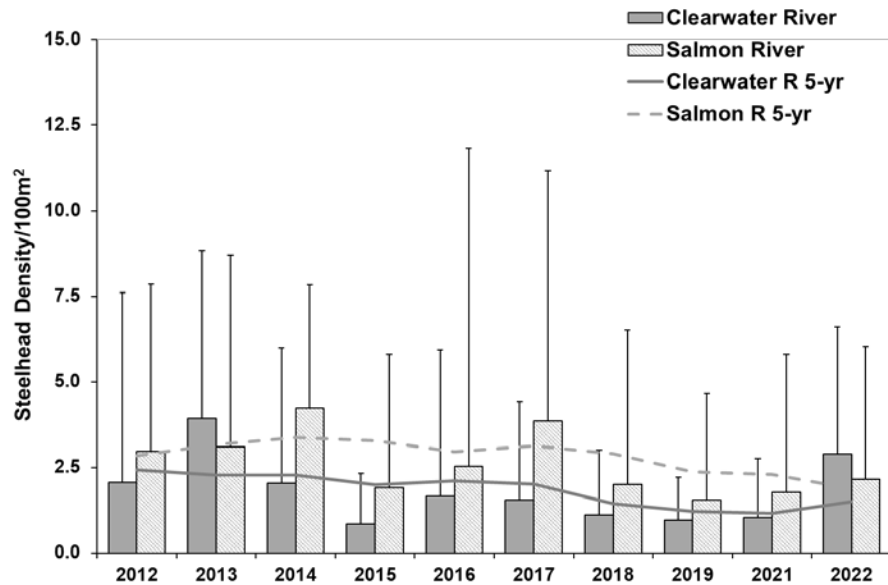


Figure 1. Mean steelhead densities (number per 100 m²) and 5-year running means observed during 2012-2022 in core trend snorkel survey transects in the Clearwater and Salmon River basins, Idaho. Running mean values are the average Steelhead density over the previous five-year period, excluding 2020. Error bars represent standard deviation.

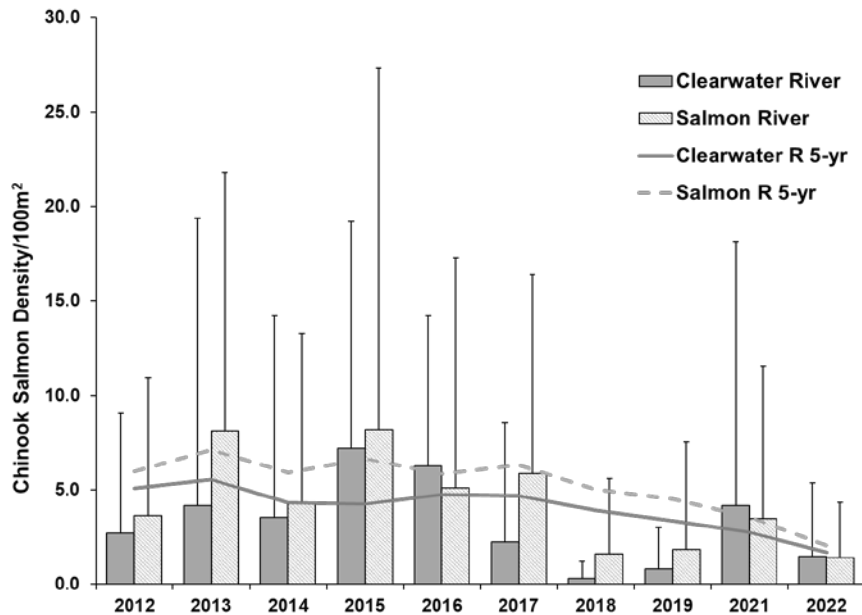


Figure 2. Mean Chinook salmon densities (number per 100 m²) and 5-year running means observed during 2012-2022 in core trend snorkel survey transects in the Clearwater and Salmon River basins, Idaho. Running mean values are the average Chinook density over the previous five-year period, excluding 2020. Error bars represent standard deviation.

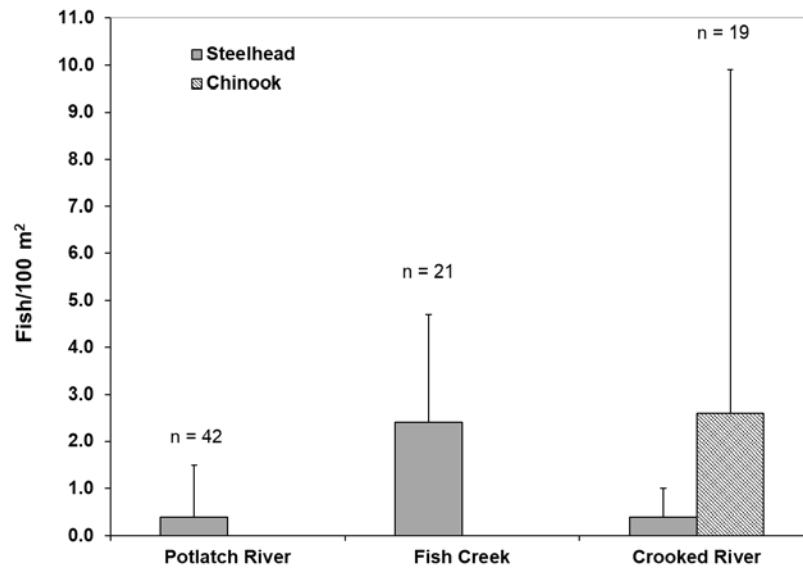


Figure 3. Mean densities of steelhead and Chinook Salmon per 100 m² observed during 2022 snorkel surveys at intensive transects in the Clearwater River basin, Idaho. No Chinook Salmon were observed in the Potlatch River or Fish Creek. Error bars represent standard deviation and “n” is the number of transects surveyed.

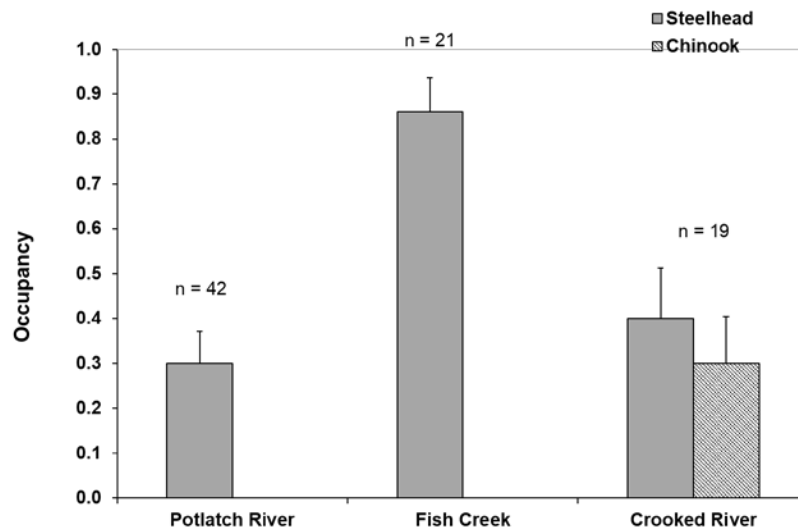


Figure 4. Occupancy rates of steelhead and Chinook Salmon observed during 2022 snorkel surveys at intensive transects in the Clearwater River basin, Idaho. No Chinook Salmon were observed in the Potlatch River or Fish Creek. Error bars represent standard deviation and “n” is the number of transects surveyed.

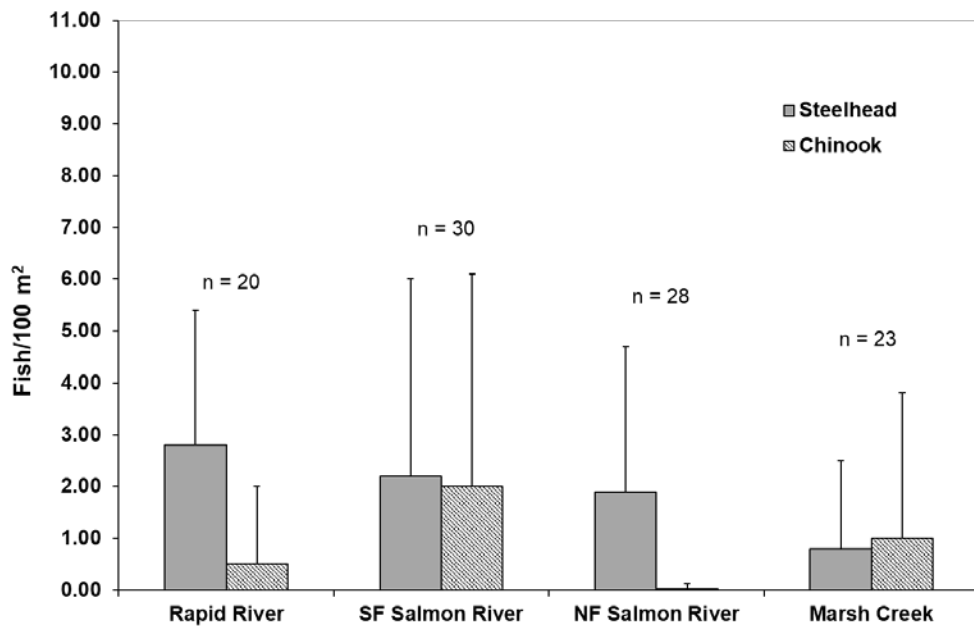


Figure 5. Mean densities (fish/100m²) of steelhead and Chinook Salmon per 100 m² observed during 2022 snorkel surveys at intensive transects in the Salmon River basin, Idaho. Error bars represent standard deviation and “n” is the number of transects surveyed.

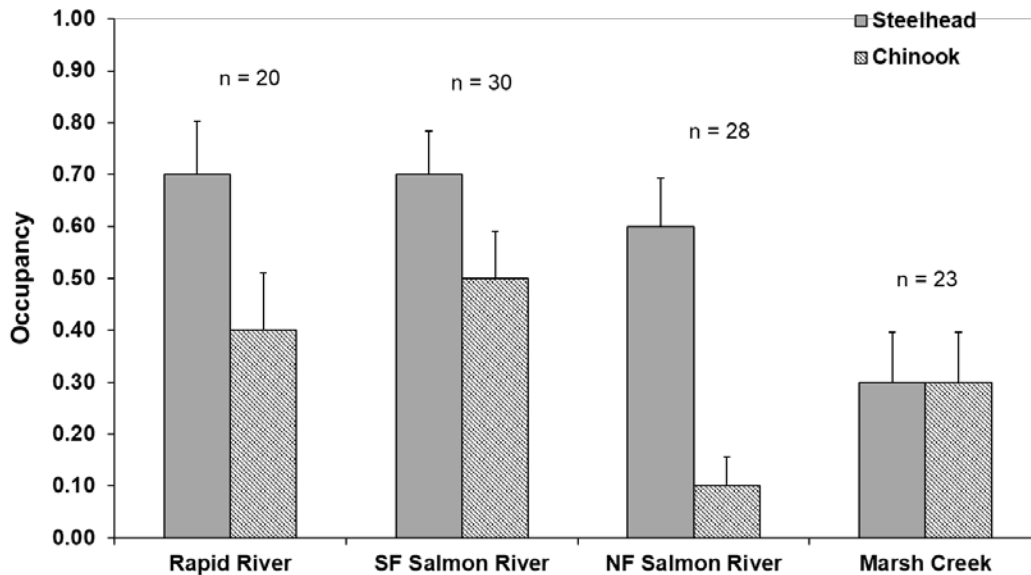


Figure 6. Occupancy rates of steelhead and Chinook Salmon observed during 2022 snorkel surveys at intensive transects in the Salmon River basin, Idaho. Error bars represent standard deviation and “n” is the number of transects surveyed.

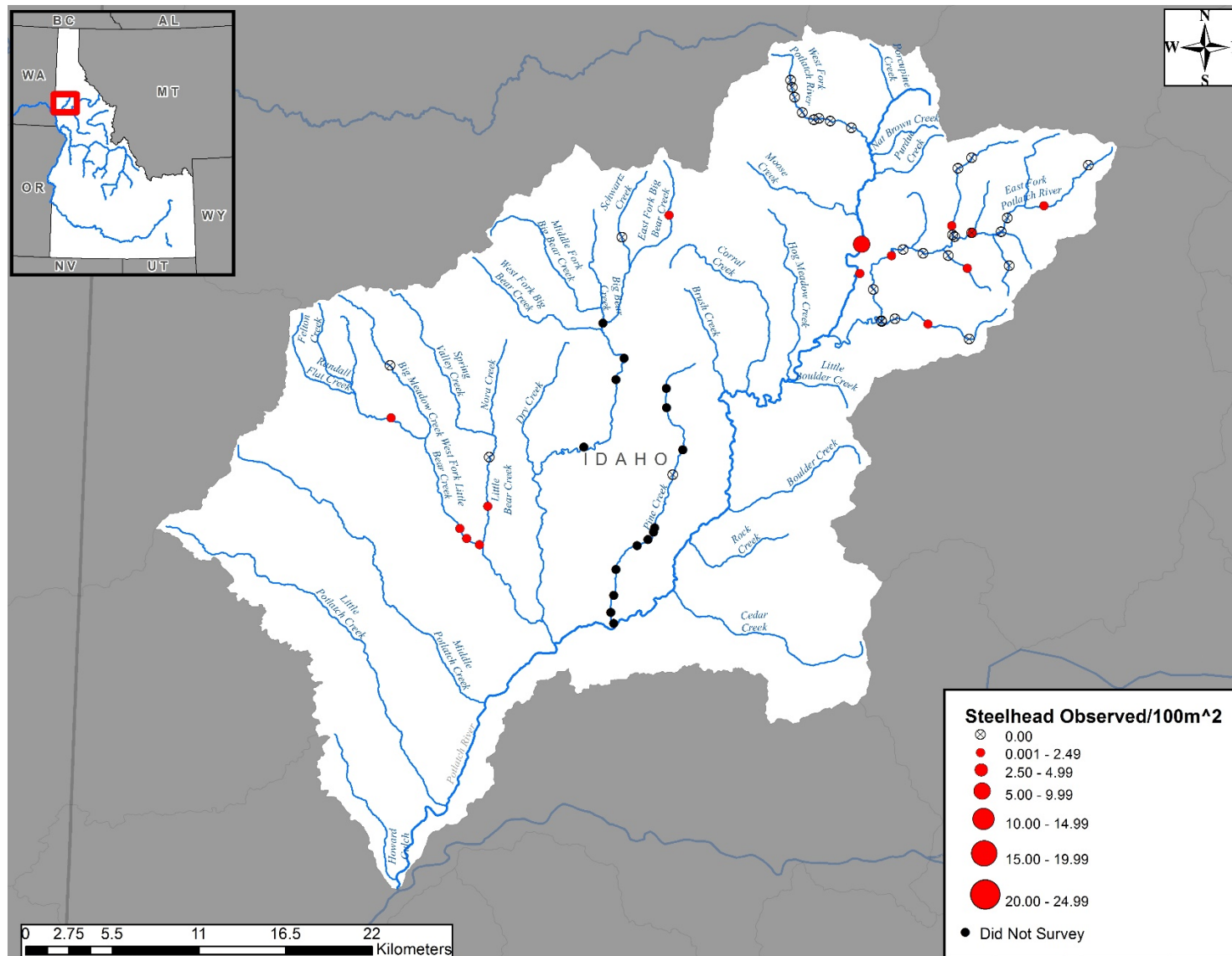


Figure 7. Map displaying the densities and distribution of steelhead observed in 2022 throughout the Potlatch River (Clearwater River basin), Idaho, during intensive GRTS snorkel surveys.

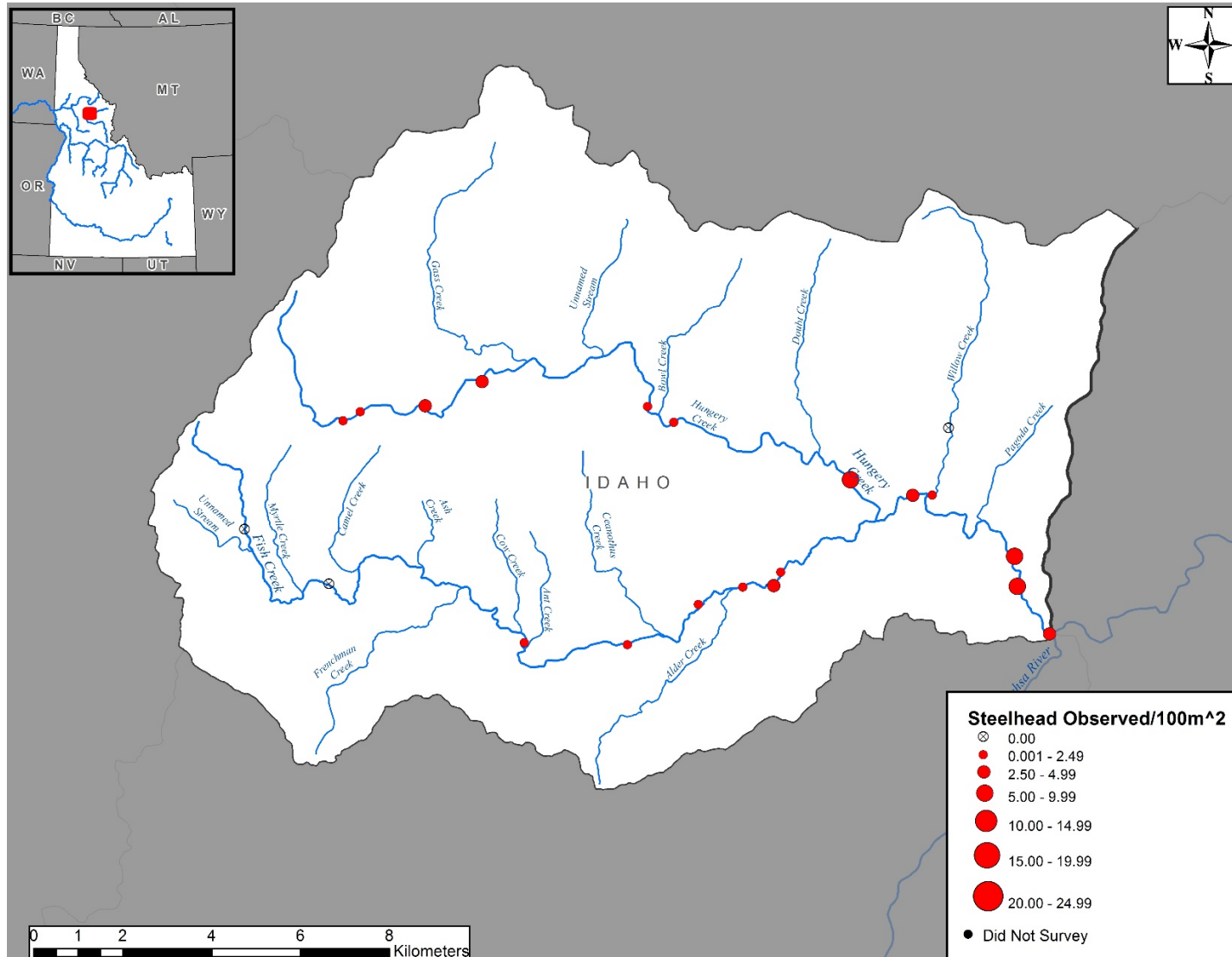


Figure 8. Map displaying the densities and distribution of steelhead observed in 2022 throughout the Fish Creek (Clearwater River basin), Idaho, during intensive GRTS snorkel surveys.

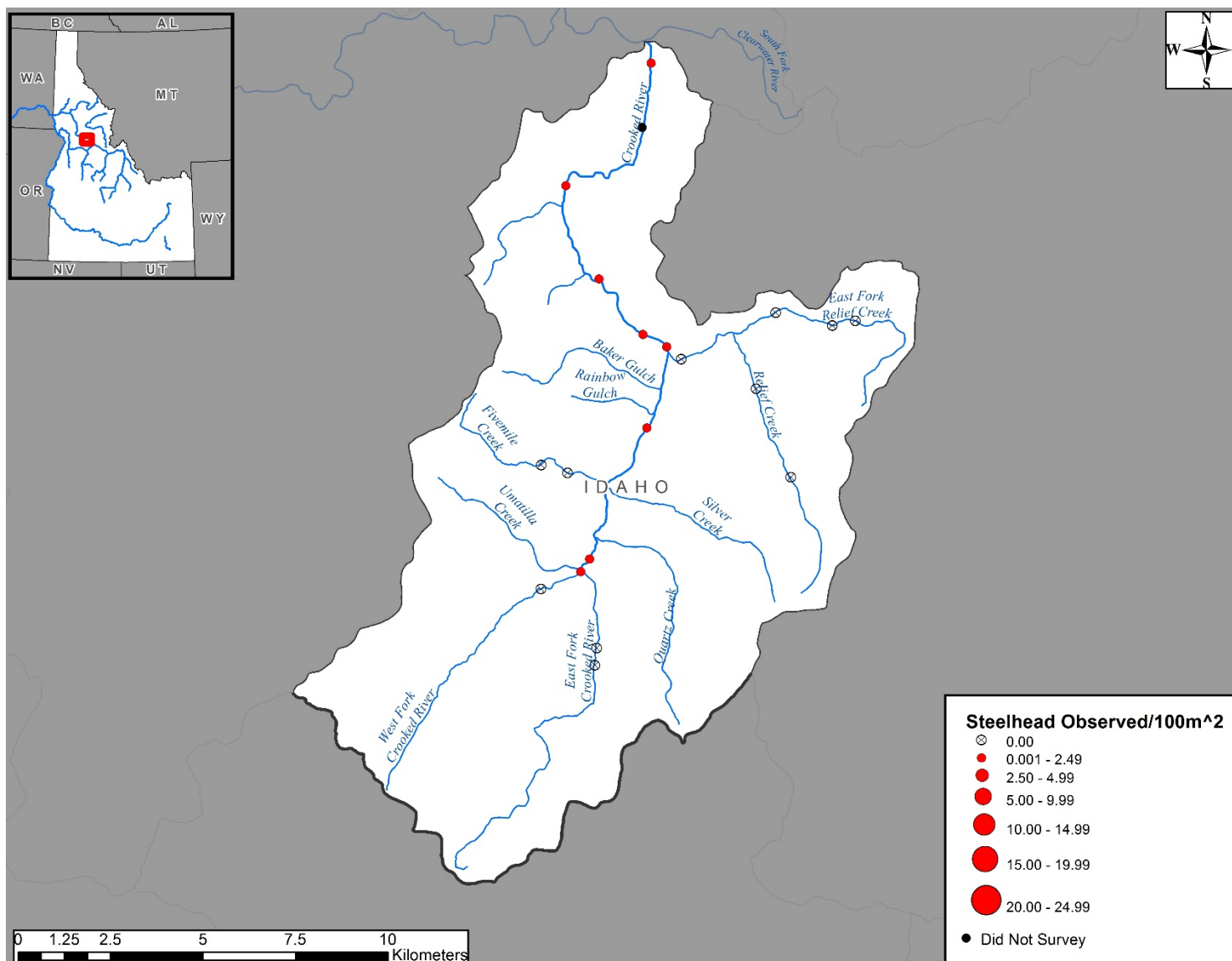


Figure 9. Map displaying the densities and distribution of steelhead observed in 2022 throughout Crooked River (Clearwater River basin), Idaho, during intensive GRTS snorkel surveys.

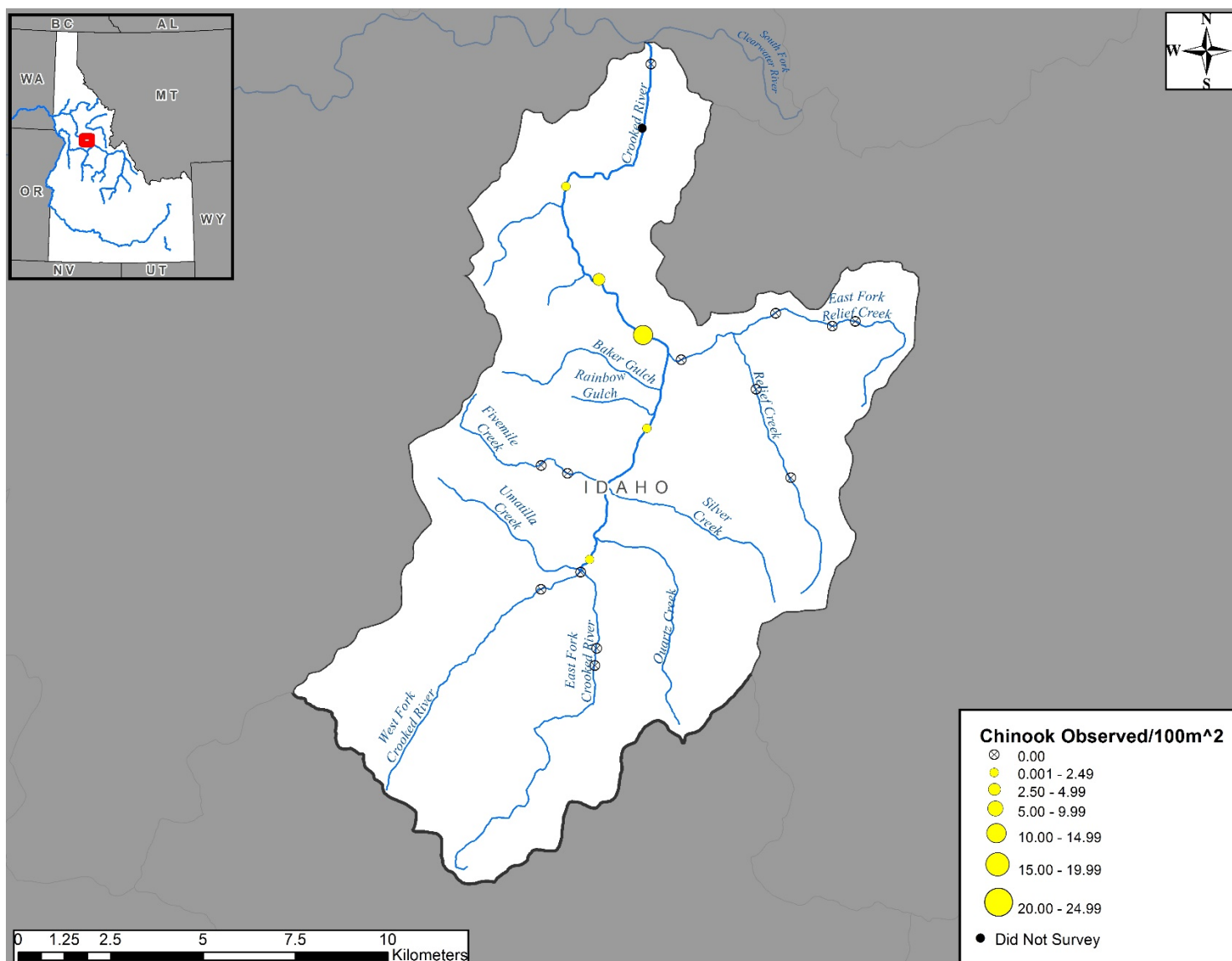


Figure 10. Map displaying the densities and distribution of Chinook Salmon observed in 2022 throughout Crooked River (Clearwater River basin), Idaho, during intensive GRTS snorkel surveys.

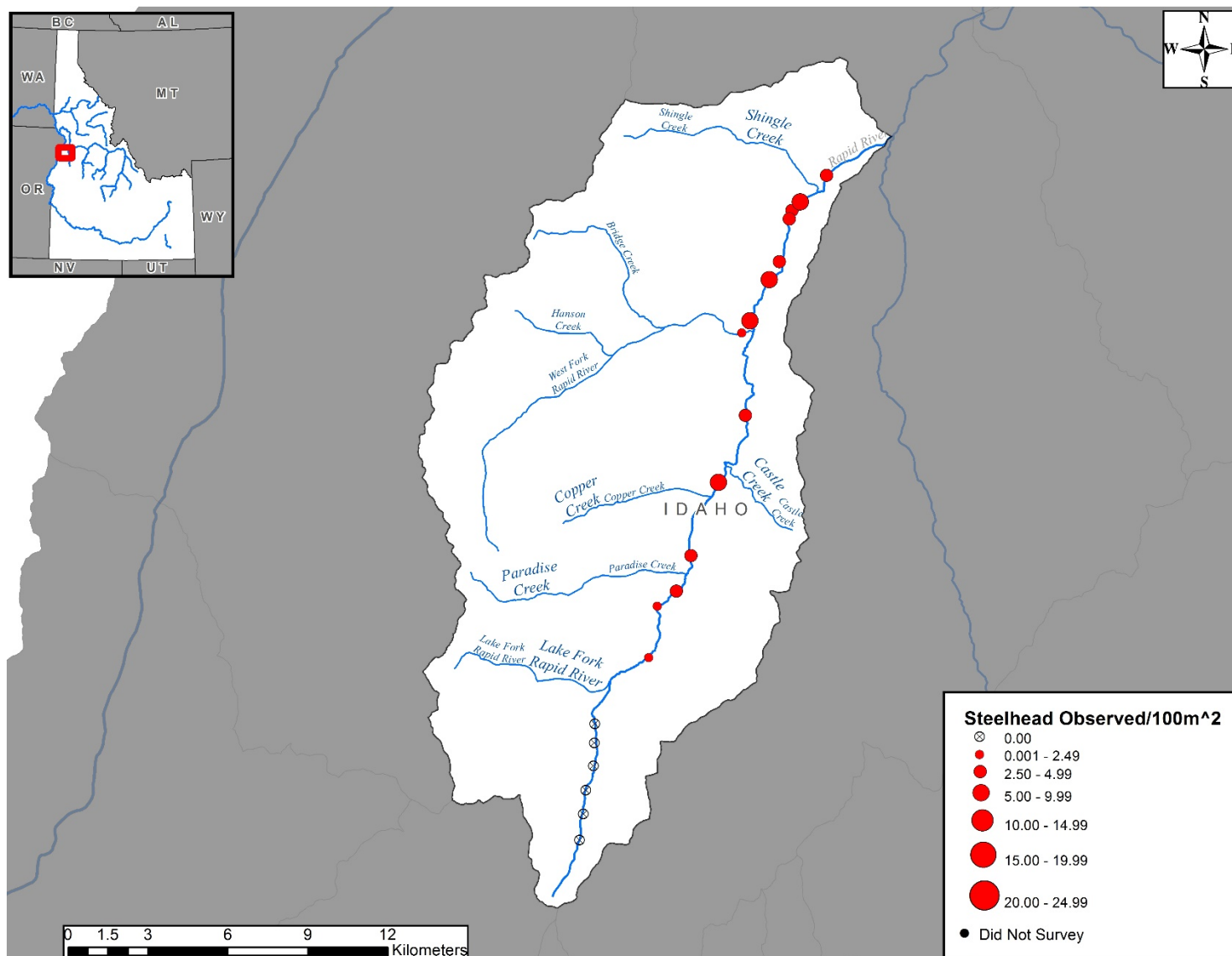


Figure 11. Map displaying the densities and distribution of steelhead observed in 2022 throughout Rapid River (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

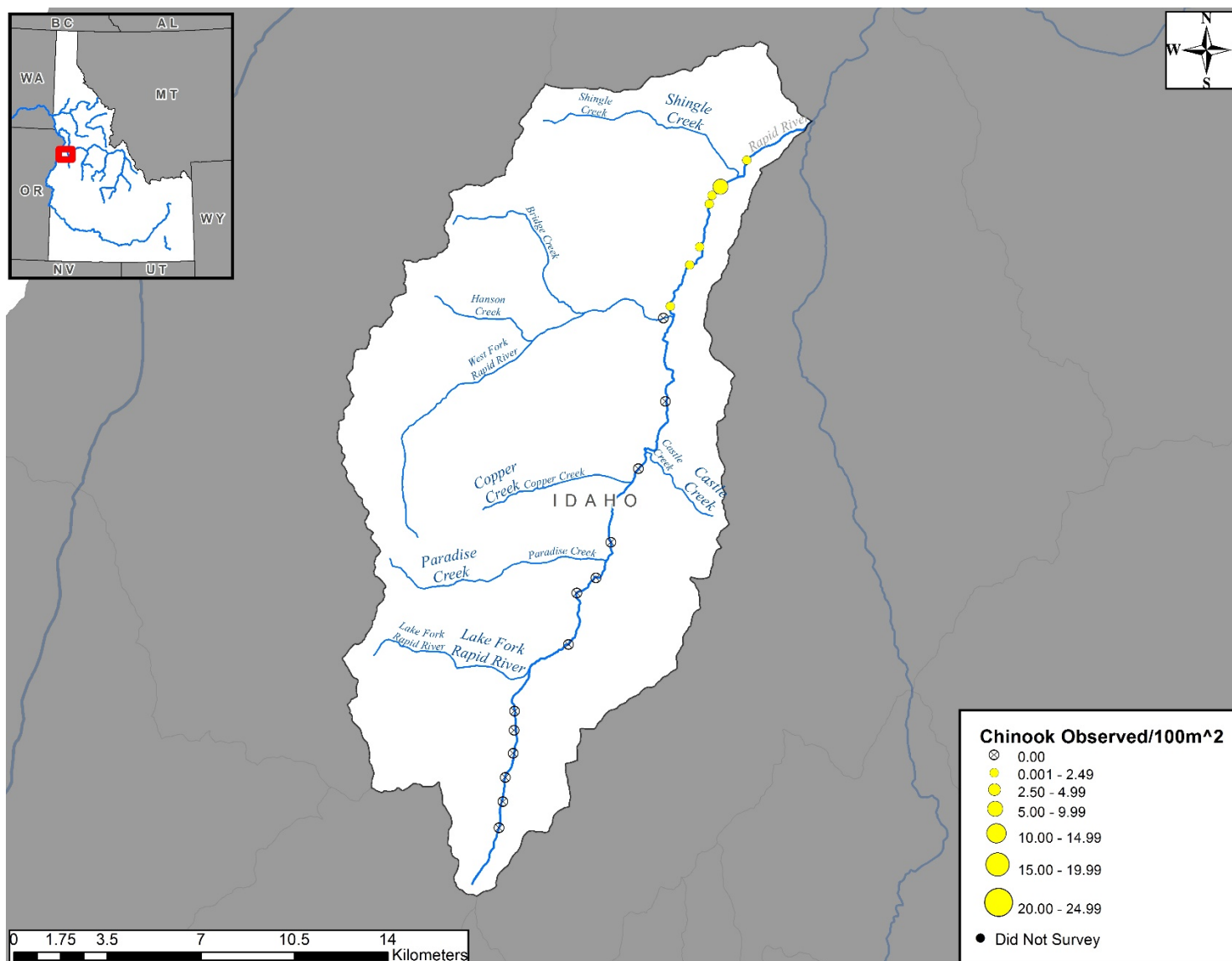


Figure 12. Map displaying the densities and distribution of Chinook Salmon observed in 2022 throughout Rapid River (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

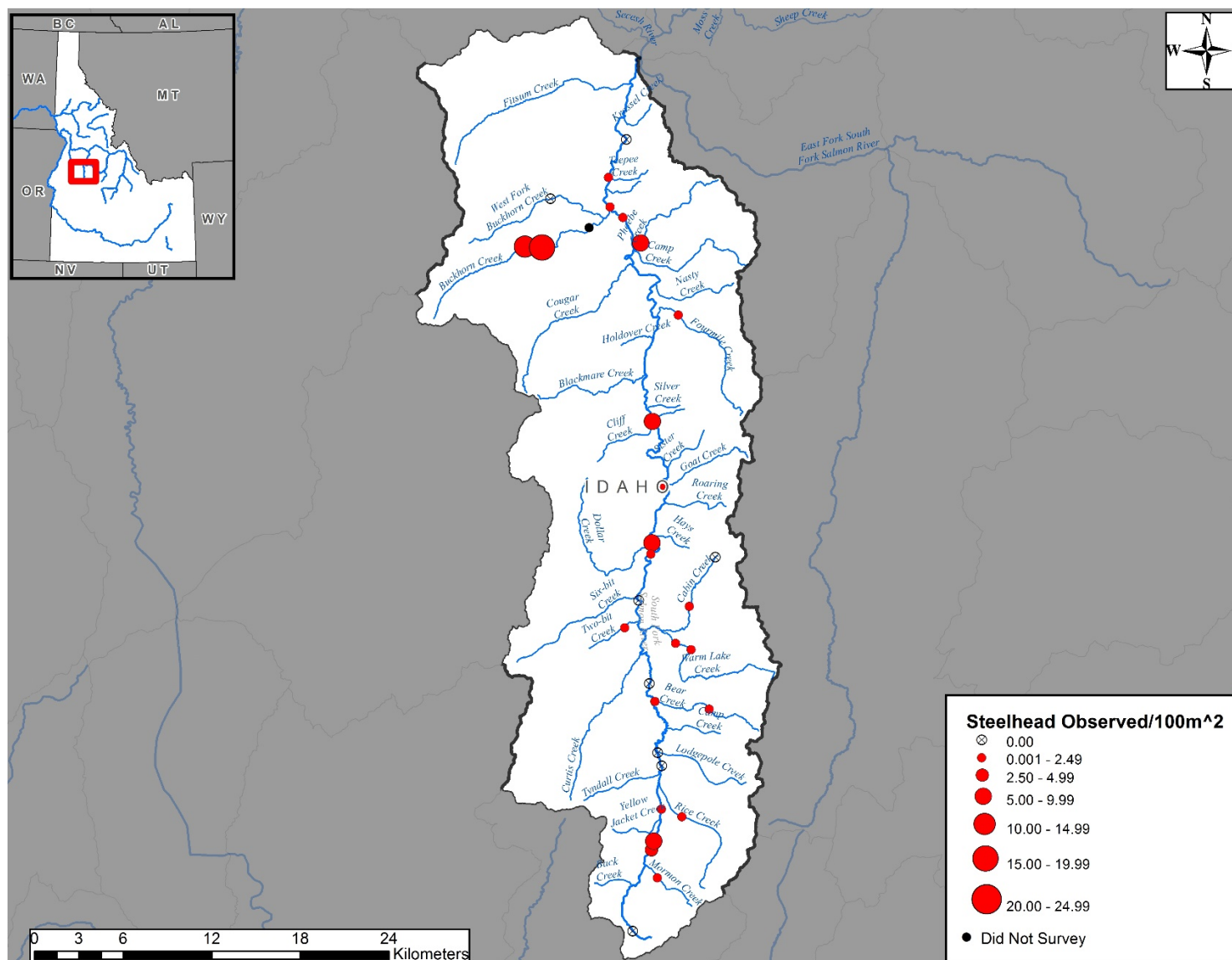


Figure 13. Map displaying the densities and distribution of steelhead observed in 2022 throughout the South Fork Salmon River (Salmon River basin above Krassel Gauge), Idaho, during intensive GRTS snorkel surveys.

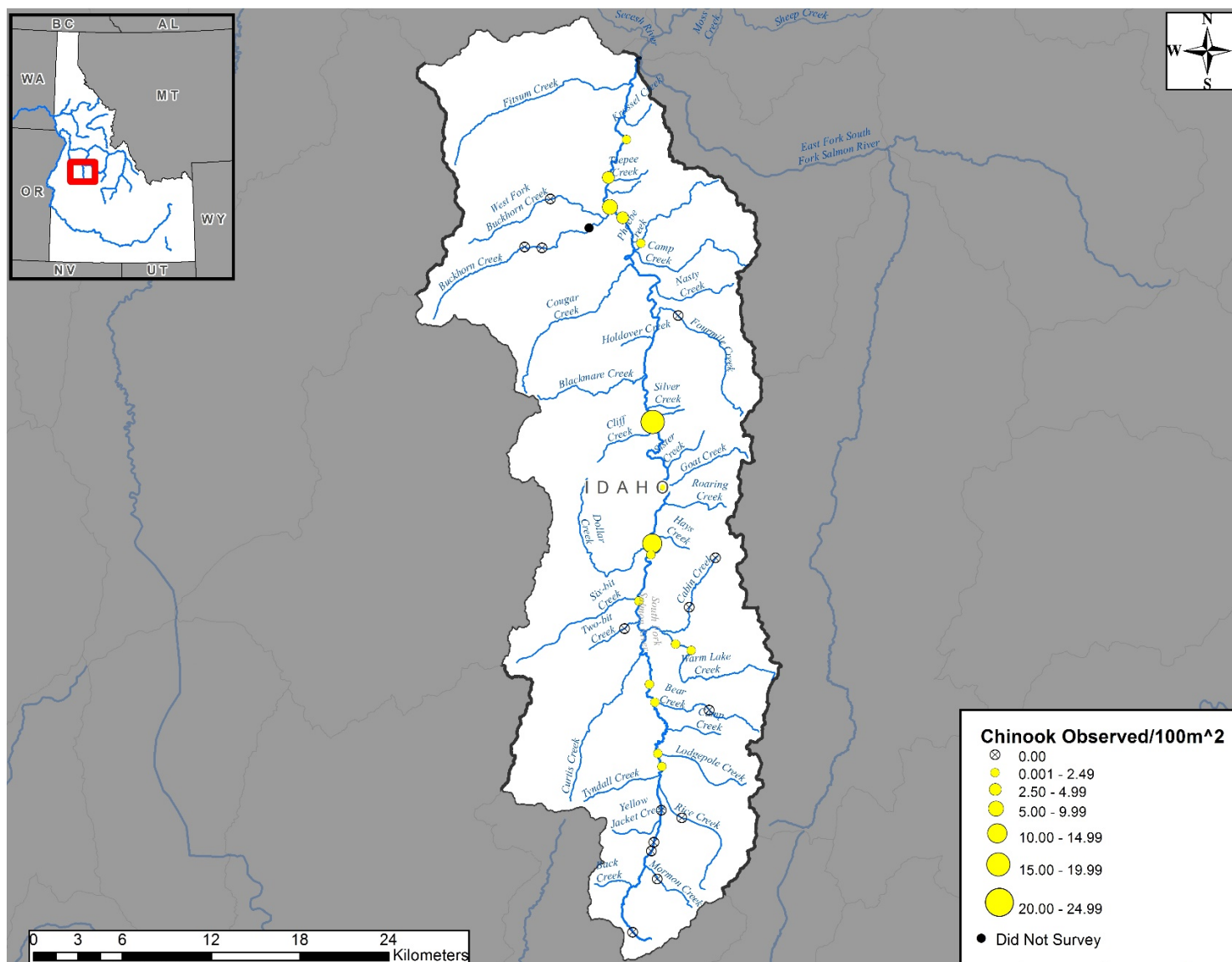


Figure 14. Map displaying the densities and distribution of Chinook Salmon observed in 2022 throughout the South Fork Salmon River (Salmon River basin above Krassel Gauge), Idaho, during intensive GRTS snorkel surveys.

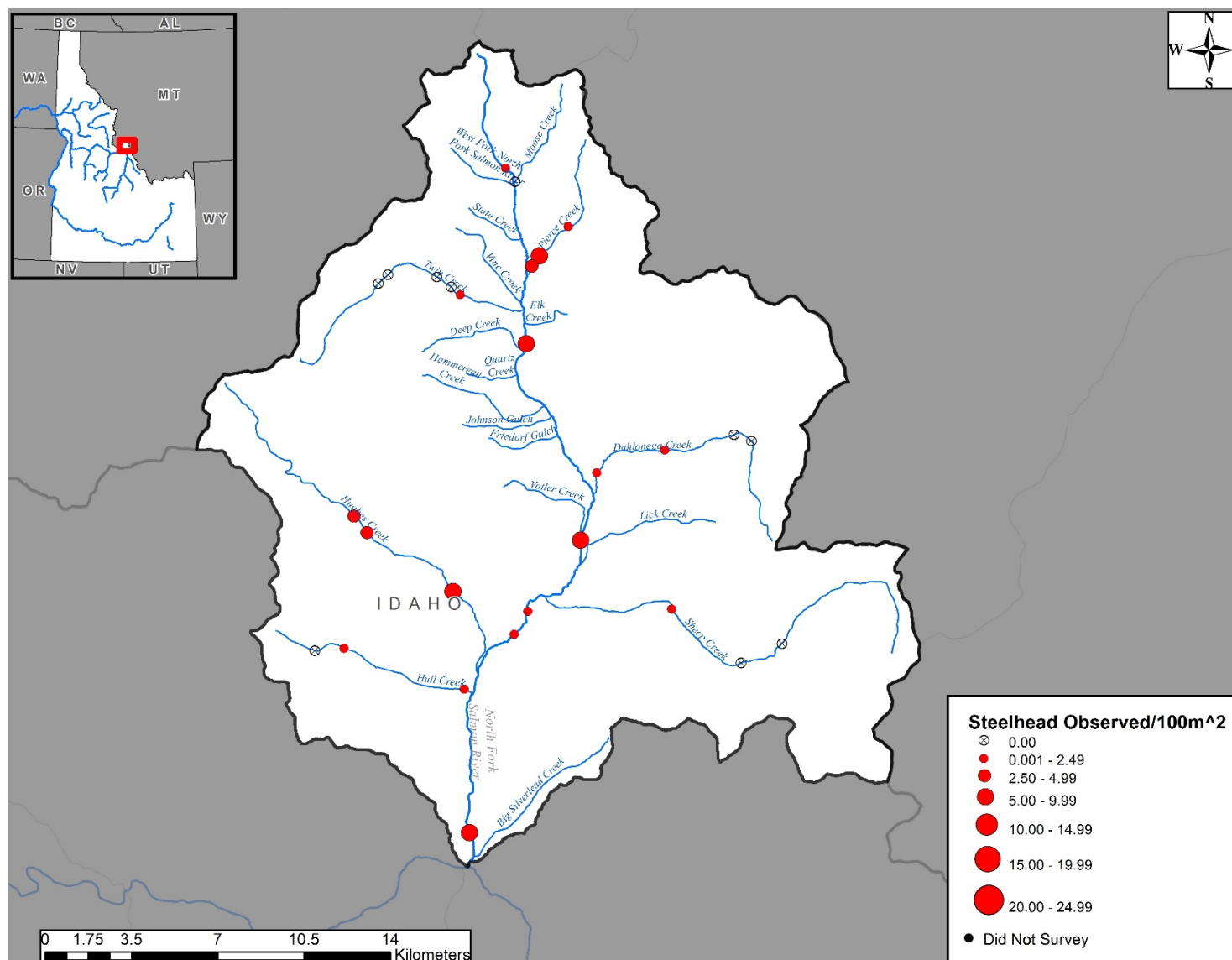


Figure 15. Map displaying the densities and distribution of steelhead observed in 2022 throughout the North Fork Salmon River (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

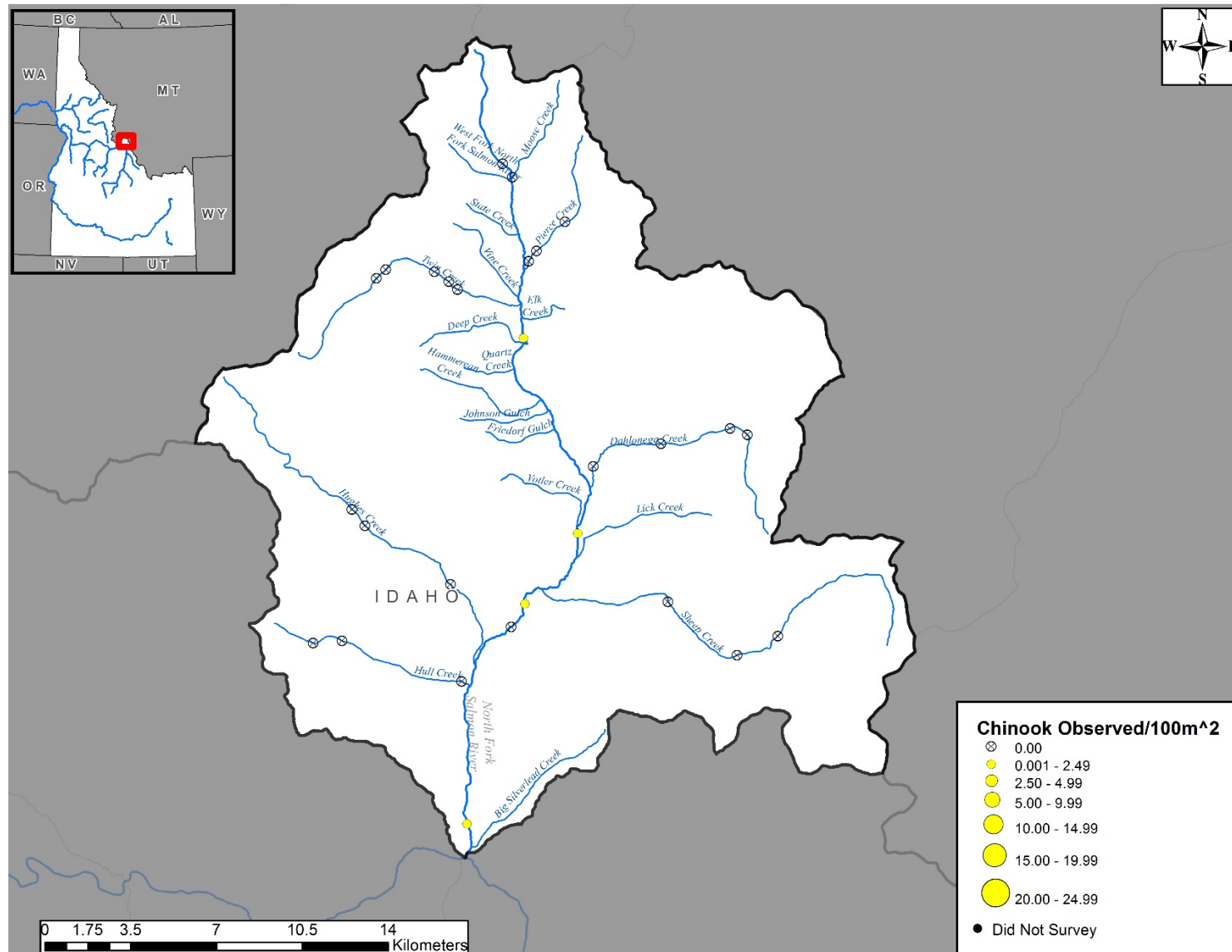


Figure 16. Map displaying the densities and distribution of Chinook Salmon observed in 2022 throughout the North Fork Salmon River (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

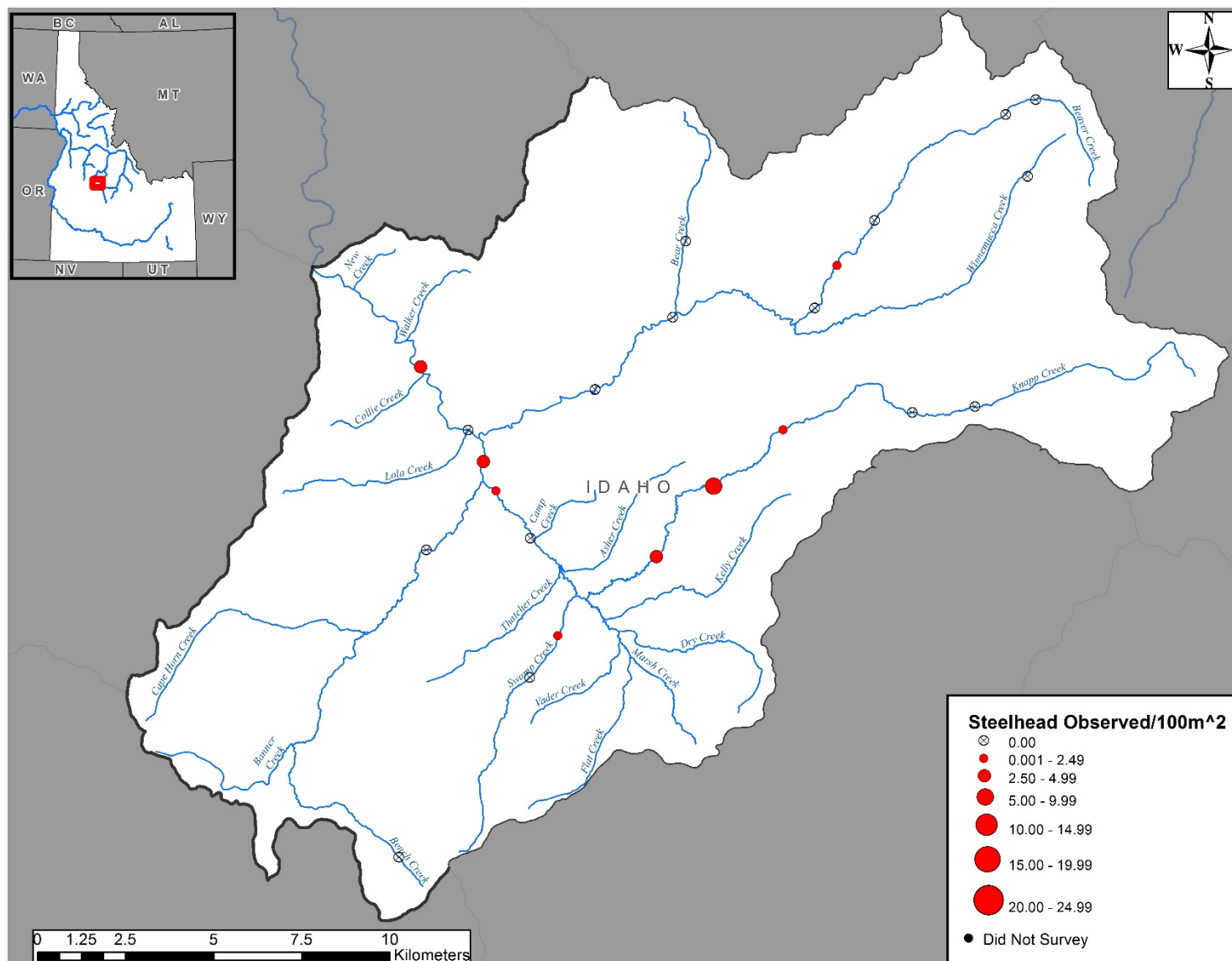


Figure 17. Map displaying the densities and distribution of steelhead observed in 2022 throughout Marsh Creek (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

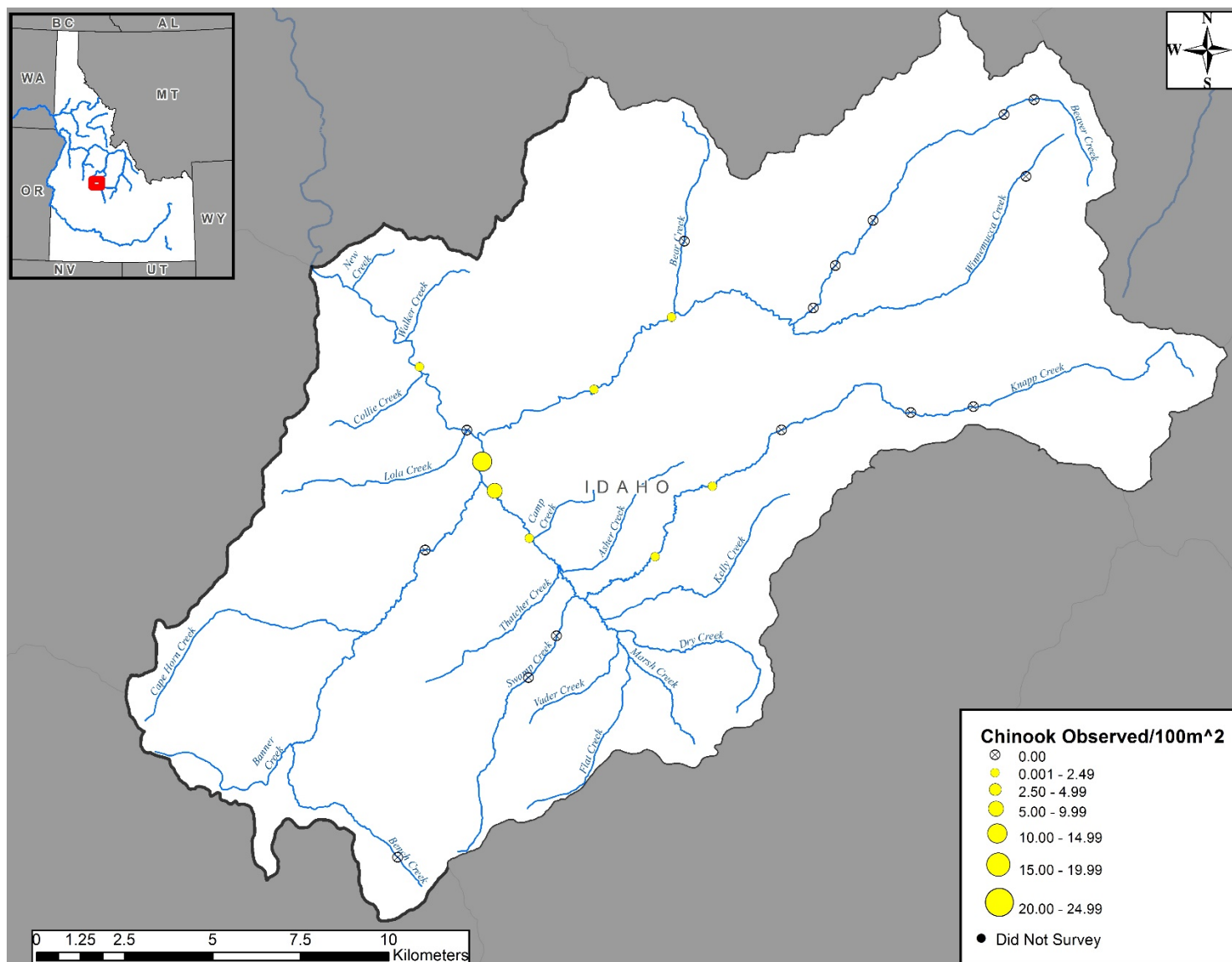


Figure 18. Map displaying the densities and distribution of Chinook Salmon observed in 2022 throughout Marsh Creek (Salmon River basin), Idaho, during intensive GRTS snorkel surveys.

APPENDICES

APPENDIX A: IDFG CORE, NON-CORE, AND RESIDENT FISH SNORKEL TRANSECT
DETAILS

Appendix A1. IDFG core trend snorkel survey transects $n = 216$ by Snake River steelhead major and independent population. Middle Fork Salmon River and its tributaries were surveyed by regional management crews funded by the Dingell-Johnson Act and License funds.

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Hells Canyon Tributaries						
Hells Canyon (SNHCT-s)	Granite Creek	---	1	Annual	2021	2023
	Granite Creek	---	3	Annual	2021	2023
	Sheep Creek	---	1	Annual	2022	2023
	Sheep Creek	---	2	Annual	2022	2023
Independent Population Total:			4			
MPG Total:			4			
Clearwater River						
Lower Clearwater River (CRLMA-s)	Big Canyon Creek	---	1	Annual	2021	2023
Independent Population Total:			1			
South Fork Clearwater River (CRSFC-s)						
	American River	2	1	Annual	2022	2023
	American River	3	2	Triennial	2022	2025
	Crooked River	1	BOULDER-A	Annual	2022	2023
	Crooked River	1	BOULDER-B	Triennial	2021	2024
	Crooked River	1	SILL-LOG-B	Triennial	2021	2024
	Crooked River	2	CONTROL1	Triennial	2021	2024
	Crooked River	2	CONTROL2	Triennial	2021	2024
	Crooked River	2	TREAT2	Annual	2022	2023
	Crooked River	3	NATURAL1	Annual	2022	2023
	Crooked River	C	CAN2	Triennial	2021	2024
	Crooked River	C	CAN3	Annual	2021	2023
	East Fork Crooked River	H	EF1	Annual	2022	2023
	East Fork Crooked River	H	EF2	Triennial	2022	2025
	Johns Creek	1	1	Triennial	2021	2024
	Johns Creek	2	3	Triennial	2021	2024
	Red River	1	CNTL 1	Annual	2022	2023
	Red River	1	CNTL 2	Annual	2022	2023
	Red River	2	CNTL 2	Annual	2022	2023
	Red River	2	TREAT 2	Annual	2022	2023
	Red River	4	CNTL 2	Annual	2022	2023
	Red River	4	TREAT 2	Annual	2022	2023
	Red River	5	CNTL 2	Annual	2022	2023
	Red River	5	TREAT 2	Annual	2022	2023
	Relief Creek	1	1A	Triennial	2021	2024
	Relief Creek	1	1B	Triennial	2021	2024
	Tenmile Creek	---	1	Triennial	2021	2024
	West Fork Crooked River	H	WF1	Annual	2021	2023
	West Fork Crooked River	H	WF2	Triennial	2021	2024
Independent Population Total:			28			

Appendix A1. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Lochsa River (CRLOC-s)	Brushy Fork	3	1	Biennial	2022	2024
	Brushy Fork	3	2	Annual	2022	2023
	Colt Creek		BRIDGE	Biennial	2022	2024
	Crooked Fork Creek	1	2A	Biennial	2022	2024
	Crooked Fork Creek	2	3A	Biennial	2022	2024
	Crooked Fork Creek	2	4A	Biennial	2022	2024
	Crooked Fork Creek	3	1	Biennial	2022	2024
	Crooked Fork Creek	3	2	Biennial	2022	2024
	Crooked Fork Creek	3	2B	Annual	2022	2023
	Crooked Fork Creek	4	1B	Annual	2022	2023
	Fish Creek	---	1	Annual	2022	2023
	Fish Creek	---	2	Annual	2022	2023
	Lochsa River	---	L1	Annual	2021	2023
	Lochsa River	---	L2	Biennial	2021	2023
	Lochsa River	---	L3	Biennial	2021	2023
	Lochsa River	---	L4	Annual	2021	2023
	Old Man Creek	---	1	Triennial	2021	2024
	Postoffice Creek	---	1	Triennial	2022	2025
	Postoffice Creek	---	2	Triennial	2022	2025
	Warm Springs Creek	---	1	Biennial	2022	2024
	White Sands Creek	---	LWRMONITOR	Biennial	2022	2024
Independent Population Total:			21			
Selway River (CRSEL-s)	Bear Creek	---	1	Annual	2022	2023
	Bear Creek	---	2	Annual	2022	2023
	Deep Creek	---	CACTUS	Annual	2022	2023
	Deep Creek	---	SCIMITAR	Annual	2022	2023
	East Fork Moose Creek	---	3	Annual	2022	2023
	Meadow Creek	---	1	Annual	2021	2023
	Moose Creek	---	1	Annual	2022	2023
	Moose Creek	---	2	Annual	2022	2023
	Running Creek	---	1	Annual	2022	2023
	Running Creek	---	2	Annual	2022	2023
	Selway River	---	HELLSHALF	Annual	2022	2022
	Selway River	---	LITTLE-CW	Annual	2022	2023
	Selway River	---	MAG-XING	Annual	2022	2023
	Selway River	---	RUNNING CR	Annual	2022	2023
	Three Links Creek	---	1	Annual	2022	2023
	White Cap Creek	3	1	Annual	2022	2023
	White Cap Creek	3	2	Annual	2022	2023
	White Cap Creek	3	3	Annual	2022	2023
Independent Population Total:			18			
MPG Total:			68			

Appendix A1. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Salmon River						
Little Salmon River (SRLSR-s)	Boulder Creek	ABOVE	1	Annual	2022	2023
	Boulder Creek	ABOVE	2	Annual	2022	2023
	Boulder Creek	BELOW	3	Annual	2022	2023
	Boulder Creek	BELOW	5	Annual	2022	2023
	Hazard Creek	---	HAZ1	Annual	2022	2023
	Little Salmon River	---	1	Annual	2022	2023
	Little Salmon River	---	2	Annual	2022	2023
	Rapid River	BLW W FK	RAP2	Annual	2022	2023
	Slate Creek	---	1	Triennial	2022	2025
	Slate Creek	---	2	Triennial	2022	2025
	Slate Creek	---	3	Triennial	2022	2025
	Slate Creek	---	4	Triennial	2022	2025
	Slate Creek	---	6	Triennial	2022	2025
	South Fork White Bird Creek	---	SF-#2	Triennial	2022	2025
	South Fork White Bird Creek	---	SF-#3	Triennial	2022	2025
	West Fork Rapid River	BLW FALLS	RAP1	Annual	2022	2023
	White Bird Creek	---	1	Triennial	2022	2025
	Independent Population Total:		17			
South Fork Salmon River (SFMAI-s)	East Fork South Fork Salmon	ABV JHNSN	3	Biennial	2021	2023
	East Fork South Fork Salmon	BLW JHNSN	6	Biennial	2021	2023
	East Fork South Fork Salmon	BLW JHNSN	7	Biennial	2021	2023
	Johnson Creek	LOWER IV	L2	Triennial	2022	2025
	Johnson Creek	LOWER IV	L3	Triennial	2022	2025
	Johnson Creek	MID LOWIII	PW3B	Triennial	2022	2025
	Johnson Creek	MID UPR II	PW3A	Triennial	2022	2025
	Johnson Creek	UPPER I	M1	Triennial	2019	2023
	Johnson Creek	UPPER I	M2	Triennial	2019	2023
	Johnson Creek	UPPER I	M3	Triennial	2019	2023
	Johnson Creek	UPPER I	PW1A	Triennial	2022	2025
	Rock Creek	UPPER I	M1	Triennial	2022	2025
	Sand Creek	UPPER I	M2	Triennial	2022	2025
	South Fork Salmon River	---	11	Annual	2022	2023
	South Fork Salmon River	---	14	Annual	2022	2023
	South Fork Salmon River	---	16	Annual	2022	2023
	South Fork Salmon River	---	5	Annual	2022	2023
	South Fork Salmon River	---	7	Annual	2022	2023
	South Fork Salmon River	---	POVERTY	Annual	2022	2023
	South Fork Salmon River	---	STOLLE1	Annual	2022	2023
	South Fork Salmon River	---	STOLLE2	Annual	2022	2023
	Independent Population Total:		21			

Appendix A1. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Secesh River (SFSEC-s)	Lake Creek	---	BURGDORF	Annual	2022	2023
	Lake Creek	---	WILLOW CR	Annual	2022	2023
	Lick Creek	---	L3	Annual	2022	2023
	Secesh River	---	GROUSE	Annual	2022	2023
	Secesh River	---	LONG-GULCH	Annual	2022	2023
Independent Population Total:			5			
Chamberlain Creek (SRCHA-s)	Bargamin Creek	---	1	Biennial	2018	2023
	Bargamin Creek	---	2	Biennial	2018	2023
	Chamberlain Creek	---	CHA1	Biennial	2022	2024
	Chamberlain Creek	---	CHA4	Biennial	2022	2024
	Sheep Creek	---	L1	Biennial	2018	2023
	Sheep Creek	---	L2	Biennial	2018	2023
	West Fork Chamberlain Cr.	---	CHA2	Biennial	2022	2024
	West Fork Chamberlain Cr.	---	CHA3	Biennial	2022	2024
Independent Population Total:			8			
Lower Middle Fork Salmon River (Loon Creek and below; MFBIG-s)	Big Creek	LOWER	L1	Annual	2021	2023
	Big Creek	MIDDLE	Cabin Cr	Biennial	2022	2024
	Big Creek	MIDDLE	TAYLOR 1	Biennial	2022	2024
	Big Creek	UPPER	LOGAN CR	Biennial	2021	2023
	Camas Creek	---	2	Biennial	2021	2023
	Camas Creek	---	CAM1	Biennial	2021	2023
	Loon Creek	C CHANNEL	2	Biennial	2021	2023
	Loon Creek	LN1	3	Biennial	2021	2023
	Loon Creek	PACK BR	1	Biennial	2021	2023
	Middle Fork Salmon River	2	HOSPPL	Annual	2022	2023
	Middle Fork Salmon River	2	HOSPRUN	Annual	2022	2023
	Middle Fork Salmon River	2	TAPPANPOOL	Annual	2022	2023
	Middle Fork Salmon River	2	TAPPANRUN	Annual	2021	2023
	Middle Fork Salmon River	3	AIRSTRIP	Annual	2022	2023
	Middle Fork Salmon River	3	FLYING-B	Annual	2022	2023
	Middle Fork Salmon River	3	SURVEY	Annual	2022	2023
	Middle Fork Salmon River	4	BIG-CR-BR	Annual	2022	2023
	Middle Fork Salmon River	4	GOATPOOL	Annual	2022	2023
	Middle Fork Salmon River	4	GOATRAN	Annual	2022	2023
	Middle Fork Salmon River	4	LITOUZEL	Annual	2022	2023
	Middle Fork Salmon River	4	LOVEBAR	Annual	2022	2023
	Middle Fork Salmon River	4	OTTERBAR	Annual	2022	2023
	Middle Fork Salmon River	4	SHIPISLAND	Annual	2021	2023
	Monumental Creek	---	MON1	Triennial	2019	2023
	Monumental Creek	---	MON2	Triennial	2019	2023
	Monumental Creek	---	MON3	Triennial	2019	2023
	Monumental Creek	---	MON5	Triennial	2019	2023
	West Fork Monumental Creek	---	MON4	Triennial	2019	2023
Independent Population Total:			28			

Appendix A1. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Upper Middle Fork Salmon River (Above Loon Creek; MFUMA-s)	Beaver Creek	---	A	Annual	2022	2023
	Beaver Creek	---	B	Annual	2022	2023
	Cape Horn Creek	1	A	Annual	2022	2023
	Cape Horn Creek	2	B	Annual	2022	2023
	Elk Creek	---	1A	Annual	2021	2023
	Elk Creek	---	1B	Annual	2021	2023
	Elk Creek	---	2A	Annual	2021	2023
	Elk Creek	---	2B	Annual	2021	2023
	Knapp Creek	1	A	Annual	2022	2023
	Knapp Creek	1	B	Annual	2022	2023
	Knapp Creek	1	LCKD FENCE	Annual	2022	2023
	Marble Creek	UPPER	MAR1	Biennial	2021	2023
	Marble Creek	UPPER	MAR1B	Biennial	2021	2023
	Marble Creek	UPPER	MAR2	Biennial	2021	2023
	Marsh Creek	1	A	Annual	2022	2023
	Marsh Creek	1	B	Annual	2022	2023
	Marsh Creek	3	A	Annual	2022	2023
	Marsh Creek	4	B	Annual	2022	2023
	Marsh Creek	5	A	Annual	2022	2023
	Middle Fork Salmon River	1	BOUNDARY	Annual	2022	2023
	Middle Fork Salmon River	1	ELKHORN	Annual	2022	2023
	Middle Fork Salmon River	1	GRDLHOLE	Annual	2022	2023
	Middle Fork Salmon River	1	GREYHOUND	Annual	2022	2023
	Middle Fork Salmon River	1	INDIAN	Annual	2022	2023
	Middle Fork Salmon River	1	RAPID-R	Annual	2022	2023
	Middle Fork Salmon River	1	SHEEPEATER	Annual	2022	2023
	Middle Fork Salmon River	1	VELVET	Annual	2022	2023
	Middle Fork Salmon River	2	COUGAR	Annual	2022	2023
	Middle Fork Salmon River	2	LJACKASS	Annual	2022	2023
	Middle Fork Salmon River	2	MARBLPL	Annual	2022	2023
	Middle Fork Salmon River	2	PUNGO	Annual	2022	2023
	Middle Fork Salmon River	2	ROCK IS	Annual	2022	2023
	Middle Fork Salmon River	2	SKIJUMP	Annual	2021	2023
	Middle Fork Salmon River	2	WHITEYCX	Annual	2022	2023
Independent Population Total:			34			
Panther Creek (SRPAN-s)	Horse Creek	---	L1	Triennial	2021	2024
	Horse Creek	---	L2	Triennial	2021	2024
	Panther Creek	ABOVE	PC9	Annual	2022	2023
	Panther Creek	DS-BIGD	PC4	Annual	2022	2023
	Panther Creek	DS-BLACKB	PC6	Annual	2022	2023
	Panther Creek	DS-CLEAR	PC1	Annual	2022	2023
Independent Population Total:			6			

Appendix A1. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
North Fork Salmon River (SRNFS-s)	North Fork Salmon River	2	DAHLONEGA	Annual	2022	2023
	Pine Creek	---	BRIDGE	Annual	2022	2023
	Pine Creek	---	SAWMILL CR	Triennial	2021	2024
	North Fork Salmon River	2	HUGHES	Triennial	2021	2024
Independent Population Total:			4			
Lemhi River (SRLEM-s)	Big Springs Creek	LEM1	A	Biennial	2021	2023
	Hayden Creek	HC2	B	Biennial	2021	2023
	Hayden Creek	HC3	B	Biennial	2021	2023
	Lemhi	1	LEM3A	Biennial	2022	2024
Independent Population Total:			4			
Pahsimeroi River (SRPAH-s)	Pahsimeroi River	LOWER	DWTNLANE	Biennial	2021	2023
Independent Population Total:			1			
East Fork Salmon River (SREFS-s)	East Fork Salmon River	ABOVE-WEIR	2	Biennial	2021	2023
	East Fork Salmon River	ABOVE-WEIR	3	Biennial	2021	2023
	Morgan Creek	UPPER	BLM CAMP	Triennial	2021	2024
Independent Population Total:			3			
Upper Salmon River (SRUMA-s)	Alturas Lake Creek	2	2B	Annual	2022	2023
	Redfish Lake Creek	---	LOWER	Annual	2022	2023
	Redfish Lake Creek	---	WEIR DS	Annual	2022	2023
	Salmon River	1	RBNSN-BAR	Annual	2022	2023
	Salmon River	2	2B	Annual	2022	2023
	Salmon River	3	3B	Annual	2022	2023
	Salmon River	3	3BRA	Annual	2022	2023
	Salmon River	4	4B	Annual	2022	2023
	Salmon River	7	7A	Annual	2022	2023
	Valley Creek	1	B	Annual	2022	2023
	Valley Creek	3	A	Annual	2022	2023
	Valley Creek	3	B	Annual	2022	2023
	Valley Creek	6	B	Annual	2022	2023
Independent Population Total:			13			
MPG Total:			144			
Snake River DPS Total:			216			

Appendix A2. IDFG non-core trend snorkel survey transects n = 103 by Snake River steelhead major population group (bold) and independent population. Middle Fork Salmon River and its tributaries were surveyed by regional management crews funded by the Dingell-Johnson Act and License funds. "Opportunistic" transects are surveyed as time allows, while "variable" transects are generally surveyed upon request to address management needs.

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Hells Canyon Tributaries						
Hells Canyon (SNHCT-s)	Granite Creek	---	2	Opportunistic	2013	
Independent Population Total:			1			
MPG Total:			1			
Clearwater River						
Lower Clearwater River (CRLMA-s)	East Fork Potlatch River	---	PFI4	Opportunistic	2022	2023
	East Fork Potlatch River	---	PFI5	Opportunistic	2022	2023
	East Fork Potlatch River	---	PFI6	Opportunistic	2022	2023
	East Fork Potlatch River	---	PFI7	Opportunistic	2022	2023
	East Fork Potlatch River	---	PFI8	Opportunistic	2022	2023
	East Fork Potlatch River	---	PFI9	Opportunistic	2022	2023
	East Fork Potlatch River	---	1	Opportunistic	2022	2023
	East Fork Potlatch River	---	2	Opportunistic	2022	2023
	East Fork Potlatch River	---	3	Opportunistic	2022	2023
Independent Population Total:			9			
South Fork Clearwater River (CRSFC-s)	American River	2	1/8MABVEFK	Opportunistic	2018	
	American River	2	ABV CATTLE			
	American River	2	GRD	Variable	2018	
	American River	2	FLAT IRON			
	American River	2	RIDGE	Variable	2018	
	American River	2	GUNTLEYS	Variable	2018	
	American River	3	STOCK SIGN	Variable	2018	
	American River	1	2.25U	Variable	2018	
	American River	1	2.65U	Variable	2018	
	American River	1	GRAVEL PIT	Variable	2018	
	American River	3	.5MI BELOW			
	American River	3	BOXSING	Variable	2018	
	American River	3	BUFFALO PIT	Variable	2018	
	Crooked River	3	NATURAL3	Variable	2012	
	Crooked River	4	MEANDER2	Variable	2011	
	Crooked River	1	CONTROL2	Variable	2009	
	Johns Creek	2	4	Variable	2013	
	Red River	1	SHISSLER CR	Variable	2018	
	Red River	1	UPPER			
	Red River	1	SHISSLER	Variable	2018	
	Red River	3	BELOW WEIR	Variable	2018	
	Red River	3	OLD BRIDGE	Variable	2018	
	Red River	4	BOULDER POOL	Variable	2018	
	Red River	6	CSUP 3	Variable	2011	

Appendix A2. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
	Red River	6	CSUP 5	Opportunistic	2011	
	Relief Creek	2	2A	Opportunistic	2011	
	Relief Creek	2	2B	Opportunistic	2011	
	South Fork Clearwater River	---	103.2KM	Opportunistic	2009	
	South Fork Clearwater River	---	83.9KM	Opportunistic	2009	
	South Fork Clearwater River	---	88.7KM	Opportunistic	2009	
	South Fork Clearwater River	---	93.9KM	Opportunistic	2009	
	South Fork Clearwater River	---	98.7KM	Opportunistic	2009	
	Tenmile Creek	---	2	Opportunistic	2013	
Independent Population Total:			30			
Lochsa River (CRLOC-s)	Colt Killed Creek	---	LWRMONITOR	Opportunistic	2016	
	Fire Creek	---	1	Opportunistic	2017	
	Fire Creek	---	2	Opportunistic	2017	
	Hopeful Creek	1	1-BOOGIEDN	Opportunistic	2011	
	Split Creek	---	1	Opportunistic	2017	
	Split Creek	---	2	Opportunistic	2017	
Independent Population Total:			6			
Selway River (CRSEL-s)	East Fork Moose Creek	---	2	Opportunistic	2015	
	Gedney Creek	---	2	Opportunistic	2018	
	Marten Creek	---	1	Opportunistic	2017	
	Meadow Creek	---	2	Opportunistic	2018	
	O'Hara Creek	---	1	Opportunistic	2011	
	O'Hara Creek	---	2	Opportunistic	2021	
	Selway River	---	abv rodeo rapid	Opportunistic	2022	
	Selway River	---	above wolf cr. Rpd	Opportunistic	2022	
	Selway River	---	blw Rodeo rapid	Opportunistic	2022	
	Selway River	---	blw 3 links rpd	Opportunistic	2022	
			Moose creek		2022	
	Selway River	---	confluence	Opportunistic		
	Selway River	---	Selway lodge	Opportunistic	2022	
	Selway River	---	1 mi. blw wt cap	Opportunistic	2022	
			½ mile below		2022	
	Selway River	---	Running	Opportunistic		
	Selway River	---	½ mi. blw wt cap	Opportunistic	2022	
	Selway River	---	Abv goat cr	Opportunistic	2022	
	Selway River	---	Archer	Opportunistic	2022	
	Selway River	---	below ham rapid	Opportunistic	2022	
	Selway River	---	Blw pettibone cr	Opportunistic	2022	
	Selway River	---	cougar bluff	Opportunistic	2022	
	Selway River	---	DIVIDE	Opportunistic	2022	
	Selway River	---	dry bar	Opportunistic	2022	
	Selway River	---	rattlesnake	Opportunistic	2022	
	Selway River	---	Bad Luck CR	Annual	2022	2023
	Selway River	---	@ Lower Tango	Annual	2022	2023

Appendix A2. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
	Selway River	---	Big bend	Annual	2021	2023
	Selway River	---	Osprey Is	Opportunistic	2022	
Independent Population Total:			28			
MPG Total:			73			
Salmon River						
Little Salmon River (SRLSR-s)	Hazard Creek	---	HAZ2	Opportunistic	2021	
	Rapid River	ABV W FK	4	Annual	2021	2022
	Rapid River	ABV W FK	CASTLE CR	Annual	2021	2022
	Rapid River	ABV W FK	COPPER CR	Annual	2021	2022
	Rapid River	ABV W FK	CORA CLIFF	Annual	2021	2022
	Rapid River	ABV W FK	PARADISE	Annual	2021	2022
	Rapid River	BLW W FK	CLIFF HANG	Annual	2021	2022
Independent Population Total:			7			
	South Fork Salmon River	---	BLW HAMILTON	Opportunistic	2021	2023
Independent Population Total:			1			
Secesh River (SFSEC-s)	Lick Creek	---	L1	Opportunistic	2021	2023
Independent Population Total:			1			
Lower Middle Fork Salmon River (Loon Creek and below; MFBIG-s)	Camas Creek	---	Upper	Annual	2021	2022
	Middle Fork Salmon River	Lower	CLIFPL	Annual	2021	2022
	Middle Fork Salmon River	Lower	HANPOL	Annual	2022	2022
	Middle Fork Salmon River	Middle	AIRSTP	Biennial	2022	2024
Independent Population Total:			4			
Upper Middle Fork Salmon River (Above Loon Creek; MFUMA-s)	Indian Creek	---	Lower	Annual	2022	2023
	Indian Creek	---	Upper	Annual	2022	2023
	Middle Fork Salmon River	2022	Mahoney Camp	Annual	2022	2023
	Middle Fork Salmon River	2022	WCPB	Annual	2022	2023
	Middle Fork Salmon River	2022	LICRGS	Annual	2022	2023
Independent Population Total:			5			
Panther Creek (SRPAN-s)	Panther Creek	DS Clear	PC-1	Opportunistic	2022	
	Panther Creek	Above	US Cabin Cr	Opportunistic	2021	
Independent Population Total:			2			
Lemhi River (SRLEM-s)	Big Springs Creek	---	BSC BRIDGE	Annual	2022	2023
	Lemhi River	LEM2	B	Biennial	2021	2023
Independent Population Total:			2			
Pahsimeroi River (SRPAH-s)	Pahsimeroi River	1	Ponds	Annual	2022	2023
	Pahsimeroi River	Weir	Weir	Annual	2022	2023

Appendix A2. Continued.

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Upper Salmon River (SRUMA-s)	Hannah Slough	---	UPS Garden Cr	Annual	2019	2023
	Thompson Creek	Below	1	Opportunistic	2022	
Independent Population Total:			2			
MPG Total:			27			
Snake River DPS Total			104			

Appendix A3. IDFG resident fish trend snorkel survey transects n = 26 by Snake River steelhead major population group (bold) and independent population. Middle Fork Salmon River and its tributaries were surveyed by regional management crews funded by the Dingell-Johnson Act and License funds.

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Clearwater River						
South Fork Clearwater River (CRSFC-s)	Crooked River	1	SILL-LOG-A	Triennial	2021	2024
	Moore's Creek	---	2	Triennial	2021	2024
Independent Population Total:			2			
Lochsa River (CRLOC-s)	Squaw Cr (Waw'aalamnime)	---	7	Annual	2022	2023
Independent Population Total:			1			
Selway River (CRSEL-s)	Little Clearwater River	---	1	Annual	2022	2023
	Little Clearwater River	---	2	Annual	2022	2023
	North Fork Moose Creek	---	4	Annual	2021	2023
	Selway River	---	BEAVERPT	Annual	2022	2023
Independent Population Total:			4			
MPG Total:			7			
Salmon River						
South Fork Salmon River (SFMAI-s)	East Fork South Fork Salmon	ABV JHNSN	SUGAR CR	Biennial	2021	2023
	East Fork South Fork Salmon	BLW JHNSN	MP 35.8	Biennial	2021	2023
Independent Population Total:			2			
Secesh River (SFSEC-s)	Secesh River	---	U-SCSH-MDW	Annual	2021	2023
Independent Population Total:			1			
Lower Middle Fork Salmon River (Loon Creek and below; MFBIG-s)	Big Creek	UPPER	NEAR FORD	Biennial	2021	2023
	Camas Creek	---	1	Triennial	2016	2023
	Camas Creek	---	L1-MOUTH	Annual	2021	2023
	Loon Creek	---	L1-BRIDGE	Annual	2021	2023
	Loon Creek	---	L2-RUN	Annual	2021	2023
Independent Population Total:			5			
Upper Middle Fork Salmon River (Above Loon Creek; MFUMA-s)	Bear Valley Creek	1	A	Triennial	2021	2024
	Bear Valley Creek	2	B	Triennial	2021	2024
	Bear Valley Creek	3	A	Triennial	2021	2024
	Bear Valley Creek	9	B	Triennial	2021	2024
	Marble Creek	Lower	L1	Annual	2022	2023
	Pistol Creek	---	L1/Lower	Annual	2022	2023
	Pistol Creek	---	L2/Upper	Annual	2022	2023
Independent Population Total:			7			
Panther Creek (SRPAN-s)	Panther Creek	Above	PC10	Annual	2022	2023

Appendix A3. Continued

Steelhead major and independent population	Stream name	Stratum	Transect name	Survey frequency	Last surveyed	Next scheduled survey
Independent Population Total:			1			
Lemhi River (SRLEM-s)	Bear Valley Creek	HC1	B-LOWER	Triennial	2021	2024
	Bear Valley Creek	HC1	CAMP	Triennial	2021	2024
Independent Population Total:			2			
Upper Salmon River (SRUMA-s)	Thompson Creek	ABOVE	TWO-POLE	Biennial	2021	2023
Independent Population Total:			1			
MPG Total:			19			
Snake River DPS Total:			26			

APPENDIX B: SALMONID DENSITIES OBSERVED BY SNORKELING IN IDFG CORE
TRANSECTS, 2022

Appendix B1. Densities (fish/100 m²) of salmonids observed in 2022 at 41 core trend transects snorkeled throughout the Clearwater River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a slash indicated stratum and transect names. Transects with no slash indicate systems in which only one strata is present.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (°C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
American River	2/1	-	0.22	-	0.22	-	0.22	-	2.4	15.7
American River	3/2	1.01	1.44	-	0.05	-	0.16	-	2.6	15.5
Brushy Fork	3/1	0.30	7.10	-	2.37	-	-	0.30	2.8	15.8
Brushy Fork	3/2	0.07	4.28	-	0.71	-	-	-	2.3	12.8
Colt Creek	99/BRIDGE	0.33	-	-	3.67	-	-	-		17.0
Crooked Fork	1/2A	0.65	7.14	-	4.87	-	-	-	4.9	11.4
Crooked Fork	2/3A	-	1.39	-	0.52	-	-	-	4.8	10.4
Crooked Fork	2/4A	-	1.33	-	0.48	-	-	-	4.8	13.0
Crooked Fork	3/1	-	1.06	0.48	0.16	-	-	-	5.8	13.0
Crooked Fork	3/2	-	2.07	1.55	0.78	-	-	0.52	5.8	12.9
Crooked Fork	3/2B	-	4.01	1.04	0.83	0.05	-	0.52	6.2	16.0
Crooked Fork	4/1B	-	1.59	0.18	0.55	-	-	0.18		17.1
Crooked River	1/BOULDER-A	-	1.26	0.34	-	0.11	-	-	1.8	11.8
Crooked River	2/TREAT 2	-	1.71	14.12	-	-	0.11	0.11	1.1	12.0
Crooked River	3/NATURAL 1	-	-	19.87	0.13	-	-	-	1.5	9.6
Deep Creek	CACTUS	1.00	13.04	-	0.84	-	-	-	3.0	19.5
Deep Creek	SCHMITAR	14.13	14.13	-	2.16	0.20	-	2.16	3.0	18.2
EF Crooked River	H/EF1	-	-	-	0.02	-	-	-	1.8	9.4
EF Crooked River	H/EF2	-	-	-	0.03	-	-	-	1.9	8.9
Fish Creek	1	1.62	5.37	-	1.25	-	-	0.06	2.4	16.0
Fish Creek	2	0.51	8.12	-	2.08	-	-	0.10	2.5	19.2
Johns Creek	1/1	-	3.00	0.35	0.23	-	-	0.12	2.5	16.1
Post Office Creek	1	1.49	4.70	-	4.91	-	-	-	4.4	12.9
Post Office Creek	2	-	5.29	-	1.54	-	-	-	2.7	12.0
Red River	1/CNTL 1	0.44	-	-	-	-	1.32	-	2.1	10.3
Red River	1/CNTL 2	-	-	2.49	-	-	0.96	-	2.1	12.9

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (°C)
Red River	2/CNTL 2	-	0.23	-	0.45	-	0.23	0.11	4.0	14.5
Red River	2/TREAT 2	-	0.56	-	-	-	0.45	0.11	4.0	14.5
Red River	4/CNTL 2	-	-	1.75	-	-	-	-	1.0	10.7
Red River	4/TREAT 2	-	-	1.38	0.13	-	0.07	-	1.0	10.7
Red River	5/CNTL 2	-	-	4.37	-	-	0.25	0.12	2.3	14.2
Red River	5/TREAT 2	-	-	1.43	-	-	0.06	-	2.3	14.2
Selway River	HELLSHALF	-	4.49	8.35	1.25	-	-	1.04	3.6	12.6
Selway River	LITTLE-CW	-	3.15	2.36	0.12	0.06	-	0.85	3.7	19.4
Selway River	MAG-XING	0.36	1.24	0.59	0.29	-	-	0.10	2.4	16.0
Warm Springs Creek	1	-	0.80	-	0.55	-	-	0.06	3.9	13.3
White Cap Creek	3/1	0.18	3.34	0.18	1.89	-	-	1.53	8.3	22.5
White Cap Creek	3/2	-	1.17	-	0.59	-	-	0.33	3.1	17.5
White Cap Creek	3/3	-	1.42	-	0.56	-	-	0.12	3.5	16.2
Whitebird Creek	1	-	13.05	-	-	-	-	-	2.5	18.0
White Sands Creek	LWRMONITOR	-	0.63	0.02	0.06	-	-	0.06	2.7	18.1
Mean		0.54	2.89	1.48	0.84	0.01	0.09	0.21	3.2	14.4
Standard Deviation		2.21	3.72	3.92	1.24	0.04	0.26	0.45	1.6	3.2
Proportion Occupied		0.4	0.8	0.4	0.8	0.1	0.3	0.5		

Appendix B2. Densities (fish/100 m²) of salmonids observed in 2022 at 104 core transects snorkeled throughout the Salmon River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a slash indicated stratum and transect names. Transects with no slash indicate systems in which only one strata is present.

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (°C)
Alturas Lake Creek	2/B	-	0.32	0.16	-	-	-	0.64	2.7	24.0
Beaver Creek	1/A	-	0.68	-	-	-	-	-	1.6	12.0
Beaver Creek	3/B	0.12	-	0.31	-	-	-	-	2.6	10.5
Big Creek	CABIN CR	0.03	0.26	6.25	0.14	-	-	0.68	2.2	14.2
Big Creek	TAYLOR 1	0.04	0.04	1.53	0.79	-	-	0.98	2.1	16.4
Boulder Creek	ABOVE/1	6.50	9.45	1.48	-	-	11.52	-	2.0	17.6
Boulder Creek	ABOVE/2	-	2.77	-	-	-	-	-	1.5	15.0
Boulder Creek	BELOW/3	-	23.84	2.02	-	-	-	-	0.9	16.3
Boulder Creek	BELOW/5	0.32	11.91	0.16	-	-	-	-	1.0	18.7
Cape Horn Creek	1/A	-	0.12	0.36	-	0.12	0.36	-	3.5	7.5
Cape Horn Creek	2/B	-	-	0.97	-	-	0.10	-	2.1	10.0
Chamberlain Creek	CHA1	-	2.14	7.88	0.07	0.55	-	0.48	1.8	15.1
Chamberlain Creek	CHA4	-	1.23	1.32	-	0.09	-	-	2.2	12.2
Elk Creek	1A	0.16	-	4.18	-	-	1.15	21.47	1.5	18.8
Elk Creek	1B	0.48	0.07	0.95	-	-	0.34	11.62	1.8	18.8
Elk Creek	2A	3.55	0.20	0.67	-	-	2.01	3.55	3.1	15.0
Elk Creek	2B	-	0.20	5.61	-	-	0.60	10.43	2.0	18.8
Hazard Creek	HAZ1	0.49	9.62	-	0.18	-	-	-	1.3	15.8
Johnson Creek	L2	-	1.33	15.70	0.16	-	-	0.62	2.1	12.8
Johnson Creek	L3	-	1.50	12.98	0.16	-	-	0.21	2.2	11.8
Johnson Creek	PW1A	-	0.16	-	-	0.05	0.05	1.02	1.5	17.4
Johnson Creek	PW3A	0.65	5.10	-	0.11	-	-	-	1.1	17.7
Johnson Creek	PW3B	0.14	0.28	0.14	0.07	-	-	0.28	2.9	12.0
Knapp Creek	1 LCKD FENCE	1.16	1.16	0.13	-	-	-	-	2.8	15.0
Knapp Creek	1/A	3.82	1.37	6.57	-	-	5.96	-	3.2	15.0
Knapp Creek	1/B	1.36	1.97	-	-	-	0.30	-	2.3	10.0
Lake Creek	BURGDORF	-	0.11	3.48	-	0.34	0.34	0.22	2.5	16.3

Appendix B2. Continued.

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (°C)
Lake Creek	WILLOW CR	0.28	0.28	0.56	-	0.28	1.41	-	2.6	18.0
Lemhi River	1 LEM 3A	0.17	1.20	0.09	-	-	-	0.69	0.8	13.0
Lick Creek	L3	0.25	16.38	1.00	0.25	-	0.13	0.13	2.3	18.3
Little Salmon River	1	0.16	9.10	0.72	-	-	-	-	2.2	17.5
Little Salmon River	2	-	5.71	-	-	-	-	0.53	2.3	16.5
Marsh Creek	1/A	-	-	-	-	-	-	-		9.0
Marsh Creek	1/B	0.51	0.95	1.58	0.19	0.13	-	0.06	1.6	12.0
Marsh Creek	3/A	-	-	4.61	-	-	4.98	-	1.7	13.0
Marsh Creek	4/B	-	-	0.11	-	-	0.11	8.00	1.4	13.5
Marsh Creek	5/A	-	0.20	5.44	-	-	-	0.20	2.5	14.5
MF Salmon River	AIRSTRIP	-	0.84	0.12	0.12	-	-	-	1.9	17.5
MF Salmon River	BIG-CR-BR	-	0.10	-	0.10	-	-	10.71	1.3	17.0
MF Salmon River	BOUNDARY	-	7.72	4.73	1.42	-	-	6.78	2.6	14.0
MF Salmon River	COUGAR	-	-	-	-	-	-	0.26	1.9	14.5
MF Salmon River	ELKHORN	-	0.35	-	-	-	-	0.18	2.1	12.5
MF Salmon River	FLYING-B	-	-	-	0.18	-	-	17.72	1.9	17.5
MF Salmon River	GOATPOOL	-	-	-	0.56	-	-	1.49	1.0	17.0
MF Salmon River	GOATRUN	-	-	-	0.82	-	-	1.43	1.0	18.0
MF Salmon River	GRDLHOLE	-	1.49	0.20	0.89	0.10	-	1.29	2.0	14.5
MF Salmon River	GREYHOUND	-	0.42	-	0.42	-	-	0.42	2.4	15.0
MF Salmon River	HOSPPL	-	-	-	0.82	0.16	-	0.49	1.9	17.5
MF Salmon River	HOSPRUN	-	-	0.42	1.05	0.21	-	0.42	1.8	17.5
MF Salmon River	INDIAN	-	0.38	0.67	3.27	-	-	1.44	1.9	14.0
MF Salmon River	LITOUZEL	-	-	-	0.15	-	-	0.15	1.9	19.0
MF Salmon River	LJACKASS	0.11	0.34	2.25	1.58	-	-	1.58	2.0	18.0
MF Salmon River	LOVEBAR	-	-	-	0.13	-	-	0.13	1.9	17.0
MF Salmon River	MARBLPL	-	-	-	1.41	-	-	0.79	2.0	14.5
MF Salmon River	OTTERBAR	-	-	-	2.05	-	-	0.96	1.5	17.0
MF Salmon River	PUNGO	-	0.59	-	2.51	-	-	0.30	2.2	14.5
MF Salmon River	RAPID-R	-	0.70	-	2.82	0.14	-	1.41	2.4	16.0
MF Salmon River	ROCK IS	-	-	0.09	0.28	-	-	0.37	2.2	16.0

Appendix B2. Continued.

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (°C)
MF Salmon River	SHEEPEATER	-	1.11	-	0.67	-	-	0.45	2.2	14.5
MF Salmon River	SURVEY	-	-	-	-	-	-	0.71	1.4	16.0
MF Salmon River	TAPPANPOOL	-	-	-	0.64	-	-	0.36	2.0	16.0
MF Salmon River	VELVET	-	8.20	7.24	5.31	-	-	2.90	1.4	15.0
MF Salmon River	WHITEYCX	-	0.11	-	2.01	-	-	0.89	2.2	16.0
NF Salmon River	2/DAHLONEGA	7.41	10.67	0.15	0.89	-	-	0.74	2.4	14.0
Panther Creek	ABOVE PC9	-	9.26	-	-	-	-	-	1.2	15.0
Panther Creek	DS-BIGD PC4	0.77	3.18	0.77	1.02	-	-	1.13	1.9	16.0
Panther Creek	DS-BLACKB PC6	-	-	-	-	-	-	0.71	2.0	14.0
Panther Creek	DS-CLEAR PC1	0.26	1.88	-	0.19	-	-	2.40	1.9	16.0
Pine Creek	-99 / BRIDGE	-	4.26	-	2.13	-	-	-	1.3	
Rapid River	BLW W FK / RAP2	0.23	5.89	0.46	0.23	-	-	-	3.3	15.0
Redfish Lake Creek	-99 / LOWER	0.21	3.20	0.42	-	0.14	-	0.42	3.4	20.0
Redfish Lake Creek	-99 / WEIR DS	-	0.13	-	-	-	-	-	3.8	19.0
Rock Creek	M1	0.35	-	-	-	-	13.87	-	1.1	14.2
Salmon River	1 RBNSN - BAR	0.35	0.05	-	-	-	-	0.14	2.5	14.0
Salmon River	2B	-	0.17	-	-	-	-	0.38	3.0	
Salmon River	3B	-	-	-	-	-	-	-		15.0
Salmon River	3BRA	-	0.71	0.01	0.03	-	-	0.80	3.0	18.0
Salmon River	4/B	-	0.32	-	-	-	-	0.64	2.4	13.0
Salmon River	7A	-	-	-	-	-	-	0.72	1.5	11.0
Sand Creek	M2	-	-	-	-	-	5.49	-	3.0	11.4
Secesh River	GROUSE	-	0.93	0.67	-	0.17	0.17	0.08	2.1	13.1
Secesh River	LONG-GULCH	0.57	0.45	12.91	0.04	0.24	0.16	-	1.6	16.1
SF Salmon River	5	0.12	-	0.24	-	-	-	0.12	1.6	13.7
SF Salmon River	7	0.09	-	1.50	-	-	-	1.06	1.4	13.6
SF Salmon River	11	-	1.01	7.64	-	-	-	1.12	1.6	20.0
SF Salmon River	14	-	0.12	4.75	-	-	-	0.88	1.4	21.1
SF Salmon River	16	-	0.97	0.17	0.03	-	-	1.64	1.6	16.6
SF Salmon River	POVERTY	1.32	-	6.44	-	-	-	0.24	2.7	22.5
SF Salmon River	STOLLE1	-	-	-	-	-	-	0.11	2.4	10.3

Appendix B2. Continued.

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (°C)
SF Salmon River	STOLLE2	0.13	0.13	3.34	-	-	-	0.72	1.0	18.3
SF Whitebird Creek	2	0.22	11.20	-	-	-	-	-	2.5	18.3
SF Whitebird Creek	3	-	9.62	-	-	-	-	-	1.6	17.0
Slate Creek	1	-	3.80	0.16	-	-	-	0.16	3.5	14.8
Slate Creek	2	0.63	4.08	0.31	-	-	-	-	3.8	14.8
Slate Creek	3	-	4.38	-	-	-	-	-	1.9	13.7
Slate Creek	4	0.24	0.08	-	-	0.24	-	-	2.6	15.7
Slate Creek	6	-	5.49	-	-	0.37	-	-	1.5	14.3
Valley Creek	1B	-	0.46	2.12	-	0.07	-	6.70	2.7	12.5
Valley Creek	3A	0.43	0.32	-	-	-	0.11	2.69	1.9	13.0
Valley Creek	3B	0.31	0.16	-	-	-	0.16	2.18	2.7	16.0
Valley Creek	6B	0.30	0.30	-	0.15	-	0.15	-	2.2	12.0
WF Chamberlain Creek	CHA2	-	0.23	0.35	-	0.12	-	-	1.7	16.9
WF Chamberlain Creek	CHA3	-	0.89	-	-	-	-	-	2.3	12.5
WF Rapid River	BLW FALLS/RAP 1	2.46	7.21	-	2.13	1.15	-	-	2.4	12.0
Mean		0.35	2.15	1.40	0.37	0.04	0.48	1.36	2.1	15.3
Standard Deviation		1.11	3.96	2.92	0.83	0.14	1.97	3.37	0.6	2.8
Proportion Occupied		0.4	0.7	0.5	0.4	0.2	0.2	0.6		

Appendix B3. Densities (fish/100 m²) of salmonids observed in 2022 at two core trend transects snorkeled throughout the Hells Canyon portion of the Snake River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a slash indicated stratum and transect names. Transects with no slash indicate systems in which only one strata is present.

Stream	Transect	Density (fish/100 m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Sheep Creek	1	1.77	6.47	1.77	-	-	-	-	6.0	16.5
Sheep Creek	2	3.02	12.37	0.60	-	-	-	-	5.0	16.5
Mean		2.39	9.42	1.18	0.0	0.0	0.0	0.0	5.5	16.5
Standard Deviation		0.89	4.17	0.82	0.0	0.0	0.0	0.0	0.7	-
Proportion Occupied		1.0	1.0	1.0	0.0	0.0	0.0	0.0		

APPENDIX C: SALMONID DENSITIES OBSERVED BY SNORKELING IN IDFG NON-CORE
TRANSECTS, 2022

Appendix C1. Densities (fish/100 m²) of salmonids observed in 2022 at 12 non-core transects snorkeled throughout the Clearwater River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a slash indicated stratum and transect names. Transects with no slash indicate systems in which only one strata is present. *Unknown density due to missing transect length.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
EF Potlatch River	1	-	0.33	-	-	-	-	-	1.1	14.0
EF Potlatch River	2	0.59	-	-	-	-	-	-	1.2	13.0
EF Potlatch River	3	-	1.78	-	-	-	-	-	1.0	12.0
EF Potlatch River	PFI 4	-	-	-	-	-	3.14	-	1.0	11.4
EF Potlatch River	PFI 5	-	-	-	-	-	Unknown*	-	1.2	12.0
EF Potlatch River	PFI 6	0.81	2.84	-	-	-	0.41	-	1.0	13.0
EF Potlatch River	PFI 7	1.24	0.62	-	-	-	-	-	1.3	9.0
EF Potlatch River	PFI 8	-	0.85	-	-	-	-	-	2.0	12.0
EF Potlatch River	PFI 9	0.35	0.69	-	-	-	0.69	-	1.7	12.0
Hopeful Creek	1/BOOGIEDN	0.23	0.70	-	1.40	-	-	-	6.2	12.0
Split Creek	1	-	9.23	-	4.17	-	-	0.60	3.2	14.0
Split Creek	2	-	8.01	-	5.57	-	-	-	3.2	14.0
Mean		0.27	2.09	0.0	0.93	0.0	0.38	0.05	2.0	12.4
Standard Deviation		0.41	3.17	0.0	1.91	0.0	0.94	0.17	1.6	1.4
Proportion Occupied		0.4	0.8	0.0	0.3	0.0	0.3	0.1		

Appendix C2. Densities (fish/100 m²) of salmonids observed in 2022 at 17 non-core transects snorkeled throughout the Salmon River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a slash indicated stratum and transect names. Transects with no slash indicate systems in which only one strata is present.

Density (fish/100m ²)										
Stream	Transect	Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Big Springs Creek	1 / BSC Bridge	-	2.87	-	-	-	3.92	3.92	1.2	11.0
Indian Creek	LOWER	-	1.15	-	0.66	-	1.00	0.33	2.0	13.0
Indian Creek	UPPER	-	-	3.41	-	-	-	0.45	2.2	14.0
MF Salmon River	Bernard Airstrip	-	0.13	-	0.66	-	-	0.79	1.9	18.0
MF Salmon River	Hancock Rapids Hole	-	-	-	0.83	-	-	0.83	1.5	19.0
MF Salmon River	Little Creek Guard Station	-	0.16	-	2.45	0.16	-	3.43	1.8	18.0
MF Salmon River	Mahoney Camp	-	0.26	-	6.32	-	-	0.79	1.9	14.5
MF Salmon River	White Creek Pack Bridge	-	0.04	-	0.29	-	-	0.46	2.0	17.0
Pahsimeroi River	1 PONDS	3.85	5.17	-	-	-	0.13	4.51	2.6	15.0
Pahsimeroi River	WEIR	5.86	14.91	0.40	-	-	-	1.73	2.3	13.0
Rapid River	ABV W FK/4	0.54	2.18	0.14	-	-	-	-	2.7	13.0
Rapid River	ABV W FK/CASTLE CREEK	-	4.82	-	0.42	0.17	-	-	2.8	9.0
Rapid River	ABV W FK/COPPER CR	-	2.52	-	0.37	0.19	-	-	3.0	9.0
Rapid River	ABV W FK/CORA CLIFF	1.27	4.73	0.18	-	0.09	-	-	2.6	13.0
Rapid River	ABV W FK/PARADISE	-	1.58	-	-	0.39	-	-	2.2	10.0
Rapid River	BLW W FK/CLIFF HANG	-	4.90	0.29	0.10	-	-	-	2.7	12.0
Thompson Creek	BELOW / 1	-	7.11	-	-	-	-	-	2.0	15.0
Mean		0.68	3.09	0.26	0.71	0.06	0.30	1.01	2.2	13.7
Standard Deviation (SD)		1.64	3.79	0.82	1.57	0.11	0.96	1.49	0.5	3.1
Proportion Occupied		0.2	0.9	0.3	0.5	0.3	0.2	0.6		

Appendix C3. Densities (fish/100 m²) of salmonids observed in 2022 at four resident trend transects snorkeled throughout the Clearwater River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Little Clearwater	1	-	4.46	-	-	-	-	0.39	4.4	16.0
Little Clearwater	2	-	3.56	-	0.44	-	-	0.44	4.4	16.0
Selway River	BEAVER PT.	-	2.57	4.05	0.79	-	-	0.10	3.6	17.4
Waw'aalamnime Crk	7	0.19	3.11	0.97	3.69	-	0.19	-	4.4	13.0
Mean		0.05	3.42	1.25	1.23	0.0	0.05	0.23	4.2	15.6
Standard Deviation (SD)		0.10	0.80	1.92	1.67	0.0	0.10	0.22	0.4	1.9
Proportion Occupied		0.3	1.0	0.5	0.8	0.0	0.3	0.8		

Appendix C4. Densities (fish/100 m²) of salmonids observed in 2022 at four resident trend transects snorkeled throughout the Salmon River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a / indicated stratum and transect names. Transects with no / indicate systems in which only one strata is present.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Panther Creek	ABOVE PC10	-	1.27	-	-	-	-	-	1.2	13.0
Marble Creek	LOWER L1	-	-	-	-	-	-	-	1.2	18.0
Pistol Creek	L1	-	3.65	7.31	1.22	-	-	0.81	2.2	16.0
Pistol Creek	L2	-	1.99	3.98	1.14	0.28	-	0.28	2.2	16.0
Mean		0.00	1.73	2.82	0.59	0.07	0.0	0.27	1.7	15.8
Standard Deviation		0.00	1.52	3.53	0.68	0.14	0.0	0.38	0.6	2.1
Proportion Occupied		0.0	0.8	0.5	0.5	0.3	0.0	0.5		

APPENDIX D: SALMONID DENSITIES OBSERVED BY SNORKELING IN IDFG INTENSIVE
PANEL TRANSECTS, 2022

Appendix D1. Densities (fish/100 m²) of salmonids observed in 2022 at 42 intensive panel transects snorkeled throughout the Potlatch River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Big Meadow Creek	12818	-	-	-	-	-	-	-	1.2	12.3
Bloom Creek	78705	-	-	-	-	-	1.75	-	1.3	7.9
Bob's Creek	37745	-	0.57	-	-	-	-	-	1.3	10
Bob's Creek	54129	-	-	-	-	-	-	-	1.55	9.5
Bob's Creek	86897	-	-	-	-	-	0.38	-	1.3	9.2
Bob's Creek	103281	0.60	-	-	-	-	0.90	-	1.8	9.7
EF Big Bear Creek	126946	-	1.23	-	-	-	1.23	-	1.1	7
EF Potlatch River	2929	-	-	-	-	-	-	-	1.4	11
EF Potlatch River	13169	-	0.39	-	-	-	-	-	1.1	9.8
EF Potlatch River	34786	-	-	-	-	-	-	-	1.1	14.6
EF Potlatch River	45937	-	-	-	-	-	-	-	1.25	11.5
EF Potlatch River	95089	1.37	-	-	-	-	0.51	-	2.1	9
EF Potlatch River	130018	-	0.11	-	-	-	-	-	1.2	10.1
EF Potlatch River	134001	-	0.48	-	-	-	0.16	-	1	11
EF Potlatch River	136049	-	-	-	-	-	-	-	1.1	11.2
EF Potlatch River	144241	-	-	-	-	-	-	-	1	12
EF Potlatch River	168817	-	-	-	-	-	-	-	1.1	10.9
EF Potlatch River	182242	-	-	-	-	-	-	-	0.8	11.7
EF Potlatch River	359354	-	-	-	-	-	-	-	0.9	11.7
EF Potlatch River	437698	-	-	-	-	-	-	-	0.9	10.6
Jackson Creek	26954	-	-	-	-	-	-	-	1	11
Jackson Creek	174050	-	2.20	-	-	-	1.47	-	1.1	11
Little Bear Creek	158226	-	-	-	-	-	-	-	0.8	16.3
Little Bear Creek	173074	-	1.32	-	-	-	-	-	0.8	16.1
Pine Creek	153570	-	-	-	-	-	-	-	1.1	11
Potlatch River	18402	-	0.11	-	-	-	0.43	0.11	1	14.3
Ruby Creek	31714	-	-	-	-	-	1.14	-	1.3	9.1
Ruby Creek	67554	-	-	-	-	-	-	-	1.2	10.3
Ruby Creek	NEW-RUBY	-	0.27	-	-	-	0.27	-	1.4	12
Schwartz Creek	57362	-	-	-	-	-	-	-	0.8	7
WF Little Bear Creek	136210	-	0.25	-	-	-	-	-	1.3	13.5
WF Little Bear Creek	267282	0.16	0.16	-	-	-	-	-	1.3	14.4

Appendix D1. Continued.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
WF Little Bear Creek	467986	-	1.48	-	-	-	-	-	0.8	13.2
WF Potlatch River	89221	-	-	-	-	-	2.42	-	1.6	13
WF Potlatch River	121989	-	6.41	-	-	-	-	-	2.2	9.7
WF Potlatch River	237538	0.87	-	-	-	-	0.65	-	1.3	12.3
WF Potlatch River	384133	0.51	-	-	-	-	4.61	-	1.7	11.5
WF Potlatch River	393186	-	-	-	-	-	0.58	-	1.6	10.3
WF Potlatch River	416901	-	-	-	-	-	1.08	-	1.5	14
WF Potlatch River	417762	0.36	-	-	-	-	-	-	1.2	12
WF Potlatch River	458722	-	-	-	-	-	0.76	-	1.6	11.3
WF Potlatch River	499682	-	-	-	-	-	-	-	0.9	11.8
Mean		0.1	0.3	0.0	0.0	0.0	0.4	0.1	1.5	11.3
Standard Deviation		0.3	1.0	0.0	0.0	0.1	0.8	0.3	1.6	2.1
Proportion Occupied		0.1	0.3	0.0	0.0	0.0	0.4	0.0		

Appendix D2. Densities (fish/100 m²) of salmonids observed in 2022 at 21 intensive panel transects snorkeled throughout the Fish Creek basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Fish Creek	12994	1.06	4.41	-	1.53	0.04	-	0.13	2.5	15.0
Fish Creek	20418	-	3.77	-	2.31	-	-	-	2.3	15.4
Fish Creek	41666	-	5.88	-	2.52	-	-	-	2.6	19.0
Fish Creek	57378	-	-	-	1.67	-	-	-	2.3	11.9
Fish Creek	69666	-	-	-	11.99	-	-	-	2.4	11.0
Fish Creek	74434	0.53	5.43	-	2.72	-	-	-	2.5	19.0
Fish Creek	96194	-	0.78	-	0.33	-	-	-		14.0
Fish Creek	102338	0.22	2.37	-	1.51	-	-	-	2.4	16.5
Fish Creek	151490	0.30	2.40	-	1.80	-	-	-	2.5	13.5
Fish Creek	167874	0.24	0.24	-	0.85	-	-	-	2.9	11.9
Fish Creek	172738	0.23	4.98	-	4.40	-	-	-	3.6	14.1
Fish Creek	194498	-	1.31	-	1.31	-	-	-	2.6	10.5
Hungry Creek	17314	-	2.76	-	12.07	-	-	-	1.8	12.0
Hungry Creek	24610	0.31	0.15	-	6.56	-	-	-	2.4	16.8
Hungry Creek	33698	-	1.14	-	9.85	-	-	-	1.5	16.9
Hungry Creek	58050	0.50	7.58	-	2.00	-	-	-	2.7	15.1
Hungry Creek	97698	-	0.89	-	3.86	-	-	-	2.9	13.2
Hungry Creek	164770	-	4.22	-	14.27	-	-	-	3.0	17.0
Hungry Creek	213922	-	1.38	-	5.62	-	-	-	3.3	15.6
Willow Creek	156354	-	1.17	-	5.61	-	-	-	2.4	13.7
Willow Creek	221890	-	-	-	2.43	-	-	-	2.6	12.5
Mean		0.2	2.4	0.0	4.5	0.0	0.0	0.0	2.6	14.5
Standard Deviation		0.3	2.3	0.0	4.1	0.0	0.0	0.0	0.5	2.5
Proportion Occupied		0.4	0.9	0.0	1.0	0.0	0.0	0.0		

Appendix D3. Densities (fish/100 m²) of salmonids observed in 2022 at 19 intensive panel transects snorkeled throughout the Crooked River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Crooked River	5698	0.08	1.56	4.69	0.74	-	0.25	0.08	2.0	12.3
Crooked River	50754	12.19	0.77	29.75	0.58	-	0.38	0.38	1.3	8.0
Crooked River	72258	0.09	0.45	0.09	0.27	-	-	-	1.8	10.8
Crooked River	73282	0.66	0.75	1.79	0.38	0.09	-	-	1.3	11.4
Crooked River	161346	6.49	1.40	13.05	1.33	-	-	0.07	1.4	12.0
Crooked River	202306	11.16	1.51	0.20	1.31	-	-	-	1.3	11.1
Crooked River	243266	0.07	0.66	-	1.40	0.07	0.22	0.15	1.4	10.4
EF Crooked River	55874	-	-	-	1.31	-	-	-	1.7	10.1
EF Crooked River	219714	-	-	-	1.73	-	0.13	-	1.8	9.4
EF Relief Creek	58946	-	-	-	0.78	-	-	-	2.1	9.0
EF Relief Creek	157250	-	-	-	-	-	-	-	1.2	8.5
EF Relief Creek	247362	-	-	-	3.25	-	-	-	1.6	10.0
Fivemile Creek	14914	-	-	-	1.80	-	-	-	1.5	9.5
Fivemile Creek	186946	-	-	-	1.16	-	-	-	1.3	10.4
Relief Creek	124482	0.25	-	-	2.53	-	-	-	1.2	8.8
Relief Creek	181826	-	-	-	1.58	-	-	-	1.7	9.0
Relief Creek	235074	-	-	-	2.29	-	-	-	2.7	9.0
WF Crooked River	211522	-	-	-	2.17	-	-	-	2.0	7.9
WF Crooked River	256578	-	0.76	-	0.76	-	-	-	2.1	10.0
Mean		1.6	0.4	2.6	1.3	0.0	0.1	0.0	1.6	9.9
Standard Deviation		3.8	0.6	7.3	0.8	0.0	0.1	0.1	0.4	1.3
Proportion Occupied		0.4	0.4	0.3	0.9	0.1	0.2	0.2		

Appendix D4. Densities (fish/100 m²) of salmonids observed in 2022 at 20 intensive panel transects snorkeled throughout the Rapid River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Rapid River	15762	-	4.20	-	-	0.16	-	-	2.8	11.0
Rapid River	17298	-	5.49	-	0.41	0.33	-	-	2.7	9.0
Rapid River	19346	0.17	3.89	0.25	-	0.08	-	-	3.2	12.0
Rapid River	24658	-	-	-	-	3.78	-	-	2.7	6.5
Rapid River	62354	-	3.06	0.15	-	0.31	-	-	2.9	12.0
Rapid River	90194	-	-	-	-	3.30	-	-	3.9	8.0
Rapid River	126866	-	3.81	-	0.38	2.00	-	-	2.3	10.0
Rapid River	135250	-	-	-	-	1.50	-	-	2.8	8.0
Rapid River	155730	-	-	-	-	2.68	-	-	2.8	10.0
Rapid River	192402	-	2.62	-	0.28	0.75	-	-	3.2	10.0
Rapid River	193426	-	5.80	6.88	-	-	-	-	2.70	1-
Rapid River	196690	-	0.60	-	-	1.33	-	-	3.1	8.0
Rapid River	200786	-	-	-	-	1.18	-	-	2.7	8.5
Rapid River	215954	0.59	4.06	1.53	0.59	0.29	-	-	2.5	14.5
Rapid River	237650	-	-	-	-	3.25	-	-	2.4	8.0
Rapid River	294290	-	9.40	0.11	0.11	0.69	-	-	2.6	9.0
Rapid River	323474	-	2.43	-	-	1.26	-	-	2.6	9.0
Rapid River	324498	0.53	5.11	0.09	0.09	0.18	-	-	2.7	13.0
Rapid River	390034	-	4.71	0.29	0.14	-	-	-	3.7	11.0
WF Rapid River	163218	-	1.12	-	-	0.25	-	-	1.8	11.0
Mean		0.1	2.8	0.5	0.1	1.2	0.0	0.0	2.8	9.9
Standard Deviation		0.2	2.6	1.5	0.2	1.2	0.0	0.0	0.5	2.0
Proportion Occupied		0.2	0.7	0.4	0.4	0.9	0.0	0.0		

Appendix D5. Densities (fish/100 m²) of salmonids observed in 2022 at 30 intensive panel transects snorkeled throughout the South Fork Salmon River basin (above Krassel Gauge), Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed. Transect names separated by a / indicated stratum and transect names.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Bear Creek	40439	-	0.60	0.60	-	-	-	-	2.1	12.6
Bear Creek	41975	-	2.07	-	0.16	-	17.32	-	1.3	15.8
Buckhorn Creek	26655	-	11.77	-	-	-	-	-	1.4	13.0
Buckhorn Creek	39967	-	16.58	-	-	-	-	-	4.2	15.0
Cabin Creek	43511	-	-	-	-	0.65	-	-	1.4	11.5
Cabin Creek	59895	-	1.13	-	-	-	3.78	-	2.8	14.2
Dollar Creek	72183	-	5.83	14.70	-	-	-	0.28	2.3	14.9
Fourmile Creek	18975	-	0.21	-	0.85	0.21	-	-	1.5	15.8
Mormon Creek	104951	-	0.54	-	-	1.36	-	-	1.3	12.6
Phoebe Creek	29727	1.24	6.63	1.24	-	-	-	-	0.9	17.8
Rice Creek	31223	-	0.17	-	-	0.17	0.34	-	1.6	12.4
SF Salmon River	543	0.98	0.72	3.63	0.04	-	-	0.74	2.8	21.0
SF Salmon River	6159	-	-	-	-	0.48	-	-	1.2	9.8
SF Salmon River	7199	-	0.18	4.88	-	-	-	0.59	1.5	16.9
SF Salmon River	10743	0.11	0.30	1.86	-	-	-	0.08	1.3	15.4
SF Salmon River	12831	-	2.39	1.84	0.05	-	-	0.55	1.7	17.4
SF Salmon River	14839	0.11	-	0.22	-	-	-	-	1.2	14.6
SF Salmon River	23031	0.10	3.05	-	-	0.10	0.19	0.86	1.3	15.2
SF Salmon River	29215	-	5.10	17.14	0.41	-	-	0.34	1.7	18.0
SF Salmon River	33311	0.04	-	1.62	-	-	-	0.02	2.0	15.7
SF Salmon River	44535	0.04	-	1.33	-	-	-	0.17	2.3	15.2
SF Salmon River	47607	0.12	-	2.05	-	-	0.12	0.12	1.6	17.0
SF Salmon River	60447	0.30	1.48	5.77	0.03	0.03	-	0.40	1.5	19.0
SF Salmon River	63991	-	0.97	-	-	-	-	-	2.5	10.8
SF Salmon River	73207	-	-	0.90	-	-	-	-	2.5	13.5
SF Salmon River	88567	-	5.10	-	-	0.22	0.11	-	1.2	16.5
Two-bit Creek	77303	2.10	1.05	-	-	-	-	-	2.0	9.5
Warm Lake Creek	28151	9.52	0.41	0.83	-	-	29.40	0.21	1.3	14.4
Warm Lake Creek	50167	0.52	0.35	1.22	-	0.17	5.24	-	1.7	18.2
WF Buckhorn Creek	56351	1.48	-	-	7.12	-	0.30	-	1.3	11.3
Mean		0.6	2.2	2.0	0.3	0.1	1.9	0.1	1.8	14.8
Standard Deviation		1.8	3.8	4.1	1.3	0.3	6.2	0.2	0.7	2.8
Proportion Occupied		0.4	0.7	0.5	0.2	0.3	0.3	0.4		

Appendix D6. Densities (fish/100 m²) of salmonids observed in 2022 at 28 intensive panel transects snorkeled throughout North Fork Salmon River basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)								Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	WS Cutthroat Trout x Rainbow Trout		
Dahlonge Creek	Upper 68575	-	-	-	-	-	-	-	0	1.3	9
Dahlonge Creek	Middle 29663	-	0.72	-	-	-	-	-	0	1.3	
Dahlonge Creek	Middle 3039	-	-	-	-	-	-	-	0	1.05	8
Dahlonge Creek	-99 / 46047	-	0.46	-	-	0.23	-	-	0	1.2	10
Hughes Creek	Middle 77631	0.42	3.35	-	1.05	0.42	-	-	0	1.6	10.5
Hughes Creek	Middle 98015	-	2.79	-	-	0.60	-	-	0	1.8	11
Hughes Creek	-99 / 110303	-	5.16	-	-	-	-	0.27	0	1.5	12
Hull Creek	-99 / 216895	-	-	-	-	-	-	-	0		10
Hull Creek	-99 / 81631	2.80	0.70	-	-	-	-	-	0	1	9
Hull Creek	-99 / 245471	-	0.69	-	-	-	0.69	-	0	0.9	
Moose Creek	Lower 11743	-	-	-	1.12	-	-	-	0	1.5	9
NF Salmon River	Lower 20959	0.10	5.93	0.10	2.15	-	-	5.62	0	1.7	15
NF Salmon River	Middle 106207	1.76	7.67	0.13	-	-	-	0.50	0	1.6	15
NF Salmon River	Middle 21471	-	7.35	0.23	0.23	0.23	-	0.11	0	2.1	10
NF Salmon River	Middle 61151	-	1.63	-	0.21	-	0.07	0.35	0	2.1	11
NF Salmon River	Middle 93919	-	1.37	0.11	-	-	-	0.23	0	1.7	11
NF Salmon River	Upper 118239	-	0.84	-	-	-	-	-	0	3.1	9
Pierce Creek	-99 / 241119	-	9.58	-	-	-	-	-	0	1	
Pierce Creek	Lower 110047	-	4.08	-	-	-	-	-	0	1.9	
Pierce Creek	Lower 44511	-	1.56	-	-	-	-	-	0	1	13
Sheep Creek	Lower 44767	-	-	-	-	1.07	-	-	0	2.9	10.5
Sheep Creek	Upper 20191	-	0.48	-	-	0.97	-	-	0	3.5	9.5
Sheep Creek	Upper 77535	-	-	-	-	1.83	-	-	0	2.2	7.5
Twin Creek	Lower 15839	-	-	-	-	1.72	-	-	0	2.1	8.5
Twin Creek	Lower 32223	-	-	-	0.22	2.86	0.22	-	0	2.2	8
Twin Creek	Lower 56799	-	0.12	-	-	0.35	0.83	-	0	3.2	6
Twin Creek	Lower 114143	-	-	-	-	0.35	-	-	0	1	7
Twin Creek	Middle 97759	-	-	-	-	0.55	-	-	0	1.7	9
Mean		0.2	1.9	0.02	0.2	0.4	0.1	0.3	0.0	1.8	9.9
Standard Deviation		0.6	2.8	0.1	0.5	0.7	0.2	1.1	0.0	0.7	2.2
Proportion Occupied		0.1	0.6	0.1	0.2	0.4	0.1	0.2	0.0		

Appendix D7. Densities (fish/100 m²) of salmonids observed in 2022 at 23 intensive panel transects snorkeled throughout the Marsh Creek basin, Idaho. Trout fry = all trout <50 mm that could not be distinguished between steelhead and Westslope Cutthroat Trout. Dashes represent transects in which no fish of a given type were observed.

Stream	Transect	Density (fish/100m ²)							Visibility (m)	Temp (C)
		Trout fry	Steelhead	Chinook Salmon	WS Cutthroat Trout	Bull Trout	Brook Trout	Whitefish		
Bear Creek	FS 008 Bridge / 109911	2.19	-	-	-	-	-	-	1.70	10.50
Beaver Creek	Above Bear Cr 51031	-	0.11	-	-	-	0.32	-	2.90	1-
Beaver Creek	Above Bear Cr 83799	-	-	-	-	-	-	-	3.90	9.00
Beaver Creek	Above Bear Cr 15703	-	-	-	-	-	-	-	2.70	12.00
Beaver Creek	Beaver Ck Trailhead 32111	-	-	-	-	-	-	-	2.30	9.50
Beaver Creek	Beaver Ck Trailhead 9711	-	-	-	-	-	0.31	-	2.90	11.00
Beaver Creek	Below Bear Cr 11607	-	-	1.81	-	-	0.12	-	2.80	12.00
Beaver Creek	Below Bear Cr 27991	0.16	-	0.23	-	-	-	0.23	2.60	9.50
Bench Creek	Above Hwy 21 101719	-	-	-	-	1.25	-	-	2.20	6.00
Cape Horn Creek	Borrow Pit 150871	-	-	-	-	-	-	-	4.00	9.00
Knapp Creek	Above FS Station 126295	0.16	4.21	1.78	0.16	0.16	1.30	-	2.80	17.00
Knapp Creek	Above FS Station 164695	-	-	-	-	-	-	-	2.90	8.00
Knapp Creek	Above FS Station 40279	1.36	5.09	0.17	-	-	1.02	0.34	3.00	15.00
Knapp Creek	Above FS Station 130391	-	-	-	-	-	-	-	2.60	1-
Knapp Creek	Above FS Station 73047	2.65	1.03	-	0.15	-	0.59	0.15	2.20	15.00
Lola Creek	50 M Above Mouth 60274	-	-	-	-	0.28	-	-	2.40	11.00
Marsh Creek	Meadow 56663	-	-	0.32	-	-	0.08	1.85	2.30	14.00
Marsh Creek	Above Beaver Cr 89431	-	0.19	7.23	-	-	-	0.10	2.90	17.00
Marsh Creek	Below Meadow 105815	-	3.67	11.54	0.22	-	0.97	0.11	1.30	17.00
Marsh Creek	Canyon 125783	4.70	4.20	0.60	0.20	-	0.10	0.40	2.60	15.00
Swamp Creek	Lower 21847	-	0.52	-	-	-	1.56	-	2.20	14.00
Swamp Creek	Upper 120151	-	-	-	-	-	0.63	-	3.50	6.00
Winnemucca Creek	-99 / 141143	-	-	-	-	0.74	-	-	2.00	7.00
Mean		0.5	0.8	1.0	0.0	0.1	0.3	0.1	2.6	11.5
Standard Deviation (SD)		1.2	1.7	2.8	0.1	0.3	0.5	0.4	0.6	3.4
Proportion Occupied		0.3	0.3	0.3	0.2	0.2	0.5	0.3		

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