FISHERIES MANAGEMENT AND EVALUATION PLAN

ODFW Summer Steelhead Fisheries in the Grande Ronde, Imnaha, and Snake Rivers

Prepared by
Oregon Department of Fish and Wildlife

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Title. Fishery Management and Evaluation Plan for the State of Oregon's summer steelhead fisheries in the Grande Ronde, Imnaha, and Snake Rivers

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SECTION 1. FISHERIES MANAGEMENT

1.1 General objectives of the FMEP.

The objective of this FMEP is to harvest marked, hatchery-origin Snake River (SR) steelhead in a manner that does not jeopardize the survival and recovery of the listed SR steelhead Distinct Population Segment (DPS), the SR fall Chinook Evolutionary Significant Unit (ESU), or other listed anadromous species. Fall Chinook salmon are encountered during steelhead fisheries, but due to a small amount of overlap in run-timing SR spring/summer Chinook and SR sockeye are very unlikely to be caught. Steelhead fishing areas addressed in this FMEP include the mainstem Snake River, Grande Ronde River including tributaries, and the Imnaha River including tributaries.

1.1.1 List of the "Performance Indicators" for the management objectives.

- Estimates of total fishing effort and fishing opportunity (number of anglers, hours fished, number of river miles open) in Grande Ronde and Imnaha River steelhead fisheries.
- Estimates of total harvest of marked hatchery steelhead in Grande Ronde, Imnaha, and Snake River fisheries.
- Estimated encounters (fish caught and released) and encounter rate (as a proportion of the population) of unmarked, listed natural steelhead within the Grande Ronde and Imnaha River MPGs.

- Estimated total mortality (impact) and mortality rate (as a proportion of the population) of unmarked, listed natural steelhead within the Grande Ronde and Imnaha River MPGs.
- Estimated encounters (fish caught and released) and encounter rate (as a proportion of the population) of listed natural fall Chinook salmon within the Snake River ESU during steelhead fisheries.
- Estimated total mortality (impact) and mortality rate (as a proportion of the population) of listed natural fall Chinook salmon within the Snake River ESU during steelhead fisheries.

1.1.2 Description of the relationship and consistency of harvest management with artificial propagation programs.

Oregon's Snake River steelhead fisheries target hatchery-origin steelhead produced by artificial propagation programs that mitigate for fish losses resulting from the hydroelectric development of the Snake River. The Lower Snake River Compensation Plan (LSRCP) was approved by the Water Resources Development Act of 1976 and produces fish to mitigate for lost harvest opportunity caused by construction and operation of four hydroelectric dams and navigation locks on the Lower Snake River (Public Law 94-587, Section 102, 94th Congress). The Idaho Power Company (IPC) produces fish to mitigate for salmon and steelhead lost or destroyed after the construction and operation of the Hells Canyon Complex of hydroelectric dams along the Snake River (Hells Canyon Settlement Agreement 1980). Both LSRCP and IPC hatchery programs utilize different stocks of steelhead to meet program and harvest mitigation objectives.

The Grande Ronde basin program utilizes an unlisted, non-endemic, stock of Snake River origin derived from adults collected at Snake River dams between 1976 and 1979 (ODFW 2011a). This stock is commonly referred to as the "Wallowa" stock, named for the river and hatchery where these fish return and are trapped, spawned, incubated, and released (Figure 1). Adult trapping and smolt releases occur at two locations in the Wallowa River basin of Oregon (Figure 1). To meet the program goal of escaping 9,184 Wallowa program steelhead upstream of Lower Granite Dam on the Snake River, Wallowa Hatchery collects 450 adult steelhead for broodstock and releases 800,000 smolts (*U.S. v. Oregon* 2018).

The hatchery program in the Imnaha basin is designed to meet harvest mitigation objectives of the LSRCP, in addition to restoring and maintaining the natural spawning population of steelhead in Little Sheep Creek, an Imnaha River tributary (ODFW 2011b). To meet these dual objectives, the program utilizes an endemic stock listed under the Endangered Species Act (ESA) and classified as "not essential for recovery" of the DPS. Adults are trapped and smolts are released at a satellite facility of Wallowa Hatchery on Little Sheep Creek (Figure 1). On an annual basis, a sliding scale determines how many natural adults to incorporate into the broodstock and how many hatchery origin adults spawn naturally in Little Sheep Creek. To meet the program goal of escaping 2,000 Little Sheep Creek program steelhead upstream of Lower Granite Dam on the Snake River, Wallowa Hatchery collects 126 adult steelhead for broodstock and releases 215,000 smolts (*U.S. v. Oregon* 2018).

The hatchery program that contributes to the Snake River fishery below Hells Canyon Dam utilizes an unlisted Snake River stock collected at Hells Canyon Dam. The broodstock does not include unmarked (presumably natural origin) adult steelhead. Adults are collected at Hells Canyon Dam, spawned and incubated at Oxbow Hatchery (Snake River), reared at Niagara Springs Hatchery (Jerome, Idaho), and subsequently released below Hells Canyon Dam. The program produces 525,000 steelhead smolts annually (*U.S. v. Oregon* 2018).

These hatchery programs do not release non-anadromous trout with the purpose of contributing to fisheries. However, steelhead smolts do residualize at varying rates each year and do provide some harvest benefits within tributaries.

1.1.3 General description of the relationship between the FMEP objectives and Federal tribal trust obligations.

ODFW routinely coordinates at a policy and technical level with affected Tribes in the management of Oregon's steelhead fisheries. As it relates to Snake River fisheries, ODFW participates in *U.S. v. Oregon* proceedings, meetings with leadership of affected Tribes, in-season coordination meetings with Snake Basin co-managers, informal phone conferences with tribal fisheries staff, and LSRCP Annual Operating Plan (AOP) meetings regarding harvest sharing, ESA take, and other management issues for hatchery and harvest programs. ODFW similarly coordinates with those Federal agencies with direct tribal trust obligations (US Fish and Wildlife Service, NOAA Fisheries) through such avenues as *U.S. v. Oregon*, ESA permitting, the USFWS' Lower Snake River Compensation Plan and other coordination activities.

1.2 Fishery management area(s).

1.2.1 Description of the geographic boundaries of the management area of this FMEP.

This FMEP applies to steelhead fisheries managed by the State of Oregon in the Grande Ronde River and tributaries, the Imnaha River and tributaries, and the mainstem Snake River where it forms the border between the states of Oregon and Idaho. Within the geographic boundaries covered under this FMEP, reach-specific fisheries are conducted with the objective of: 1) harvesting hatchery production that exceeds the broodstock needs of congressionally mandated mitigation goals of federal and private (i.e., Idaho Power Company) hatcheries, and 2) removing hatchery steelhead that may stray to natural production areas and interact with natural steelhead. Angler effort varies temporally for each fishery area and depends on presence of hatchery-origin steelhead as they migrate to hatchery collection facilities and seasonal environmental conditions.

Within the Grande Ronde Subbasin:

<u>Lower Grande Ronde River</u>: Oregon-Washington state line upstream to the Wallowa River (RM 37-82, 45 mi; Figure 1). The primary objective of this fishery area is to harvest hatchery steelhead within their migratory corridor en route to collection facilities in the Wallowa River basin. Angler effort in this fishery predominately occurs during fall months (October-November). Most of the angler effort is concentrated from the state line upstream to Wildcat Creek, as the remaining reach is within a protected wilderness area and only accessible by non-motorized boats. Snake River fall Chinook may be encountered during October and November.

Wenaha River: Mouth upstream to Crooked Creek (RM 0-6, 6 mi; Figure 1). This fishery is managed to remove hatchery steelhead that stray into lower reaches of the Wenaha River, a natural production area within the Lower Grande Ronde steelhead population unit. Angler effort is relatively low as the Wenaha is only accessed by foot, and occurs typically during February-March. Snake River fall Chinook may also be encountered during fall months.

Upper Grande Ronde River: Wallowa River upstream to the mouth of Meadow Creek (RM 82-156, 74 mi; Figure 1). This section is open to remove hatchery steelhead that may stray and interact with natural steelhead within the upper Grande Ronde population unit. Angler effort in this area is present but at low levels, typically during February-April.

Catherine Creek: Mouth upstream to bridge on Hwy. 203 near milepost 12 (RM 0-50, 50 mi; Figure 1). Catherine Creek is open to remove hatchery steelhead that may stray and interact with natural steelhead within the upper Grande Ronde population unit. Angler effort in this area is present but at low levels, typically during February-April. Most of this fishery reach occurs on privately held lands.

Wallowa River: Mouth upstream to Trout Creek (RM 0-41, 41 mi; Figure 1). The Wallowa River consists of two primary fishing areas: The Rondowa fishery occurs within the Grande Ronde and Wallowa Rivers near their confluence mainly during December-March, and the main Wallowa River fishery occurs upstream of Minam State Park during January-April. The Rondowa fishery can only be accessed by boat, foot, and/or all-terrain vehicles (ATV only after March 15th). The Wallowa fishery between the Minam River and Rock Creek is easily accessed along Oregon State Highway 82. Upstream from Rock Creek the Wallowa River is mostly bordered by private lands. The primary objective of this fishery area is to harvest hatchery steelhead within their migratory corridor en route to collection facilities near Deer Creek and Spring Creek, and remove hatchery steelhead that may stray into natural production areas within the Wallowa population unit. High levels of angler effort occur downstream of hatchery smolt release and adult collection sites at Deer Creek (Figure 1).

Within the Imnaha Subbasin:

Imnaha River: Mouth upstream to Big Sheep Creek (RM 0-23, 23 mi; Figure 1). The primary objective of this fishery area is to harvest hatchery steelhead within their migratory corridor en route to collection facilities on Little Sheep Creek. Most of the fishery downstream of the town of Imnaha is remote and only accessed by a gravel road and/or by foot along a trail between RM 0-5 to the Snake River at Eureka Bar. Angler effort in this fishery predominately occurs during spring (February-April). Snake River fall Chinook may be encountered during October-November in the lower reaches of the Imnaha River.

Big Sheep Creek: Mouth upstream to Little Sheep Creek (RM 0-3, 3 mi; Figure 1). This section of Big Sheep is open to harvest hatchery steelhead that concentrate below adult collection facilities on Little Sheep Creek. Angler effort in this section occurs at low levels from March-April.

Within the Snake River:

<u>Snake River in Hells Canyon</u>: Oregon-Washington State line upstream to Hells Canyon Dam (RM 177-248, 71 mi; Figure 1). Primary objective of this section is to harvest hatchery-origin steelhead returning to adult collection facilities at Hells Canyon Dam. This section of the Snake River occurs entirely within federally protected wilderness and is only accessible via foot or boat. Oregon anglers mainly access this section from the Imnaha River trail or downstream of Hells Canyon Dam. Snake River Fall Chinook may be encountered during October-November.

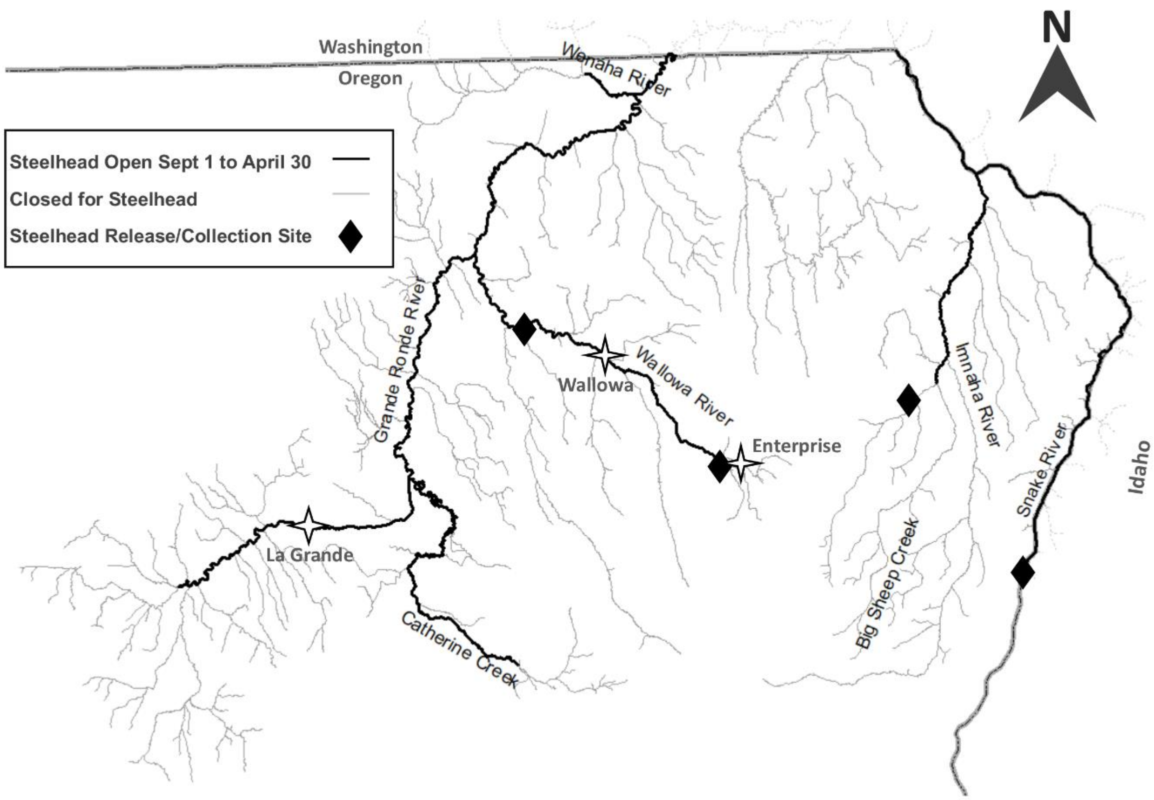

Figure 1. Fishery management area, including reaches open to steelhead and trout angling and locations of hatchery release sites, for Oregon Snake River steelhead and trout fisheries.

1.2.2 Description of the time period in which fisheries occur within the management area.

Oregon sport fishing regulations provide the requirements for fisheries within the fishery management area outlined in section 1.2.1. In both the Northeast Zone (Grande Ronde and Imnaha) and Snake River Zones, harvest of steelhead is closed in all waters with exception of the reaches listed in section 1.2.1. Within those waters exempted from general closures, steelhead season is open from 1 January - 30 April, and 1 September - 30 December annually (ODFW 2018). Regulations related to timing of fisheries for the Snake River, an interstate waterway, are set in concurrence with

Idaho Department of Fish and Game during pre-season and in-season management periods described in Section 3.5.1.

1.3 Listed salmon and steelhead affected within the Fishery Management Area specified in section 1.2.

Major Population Groupings (MPGs) are sets of populations that share genetic, geographic (hydrographic), and habitat characteristics within the ESU (ICTRT 2003, 2005). The fishery management areas described in Section 1.2.1 affect natural steelhead populations within the Grande Ronde River and Imnaha River Major Population Groupings (MPG) within the Snake River Basin Summer Steelhead Distinct Population Segment (DPS). In addition, steelhead fisheries in the Snake River and lower mainstem sections of the Grande Ronde and Imnaha Rivers during October and November may affect select spawning populations within the Snake River fall-Run Chinook Salmon population.

Snake River steelhead adults enter the Columbia River from May through August, and subsequently enter natal river systems from September through April. Spawning begins in March in lower elevation streams and spring-fed tributaries and continues until early June in higher elevation snowmelt systems. Juveniles rear across a wide range of habitats throughout the basin, and most naturally-produced smolts migrate at age-2 (Sedell et al. 2018). Smolts emigrate from natal tributaries from late-winter until late-spring with peak movements associated with runoff between mid-April and mid-May (Sedell et al. 2018). Grande Ronde and Imnaha summer steelhead are classified as part of the ‘A-run’ aggregate within the Snake River steelhead DPS (NWFSC 2015). A-run steelhead are smaller (adults range in size from 45 to 91 cm and 1.4 to 6.8 kg), most return after one or two years of ocean rearing (most spend one year), and begin their adult migration earlier in the year (ICTRT 2003).

The Interior Columbia Technical Recovery Team (ICTRT) identified populations within the Grande Ronde and Imnaha MPGs based on genetic differentiation, distance from other spawning aggregations, and other life history traits (ICTRT 2003; Figure 2).

Grande Ronde River MPG

- Lower Grande Ronde – Includes the main stem Grande Ronde River and all tributaries upstream to the confluence of the Wallowa River, excluding the Joseph Creek watershed.

- Joseph Creek – Includes all steelhead within the Joseph Creek watershed.

- Wallowa River – Includes the Wallowa River, including the Minam and Lostine rivers and several smaller tributaries.

- Upper Grande Ronde – Includes the remainder to the Grande Ronde watershed, including the main stem upper Grande Ronde and tributaries of Lookingglass Creek, Catherine Creek, and Indian Creek.

Imnaha River MPG

- Imnaha River – The Imnaha River MPG supports one population that includes steelhead spawning in the main stem Imnaha River and all tributaries.

Snake River / Hells Canyon Steelhead: Steelhead spawn in several small tributaries to the Snake River in the Hells Canyon region including, but not limited to, Captain John, Deep, Granite, and Sheep Creeks. The main stem Snake River does not support steelhead spawning, but does provide rearing habitat. Due to the small size of these tributaries, this area does not fit the definition of an independent population. It is also likely that larger upstream populations now blocked by Hells Canyon Dam maintained spawning in this area in the long-term. Currently, it is likely that strays from the Oxbow Hatchery Program that return to Hells Canyon Dam support these areas.

Snake River Fall-Run Chinook ESU: The Snake River Fall-Run Chinook ESU (Evolutionary Significant Unit) is comprised of fish that spawn in the lower mainstem of the Snake River below Hells Canyon Dam and the lower reaches of several major tributaries including the Grande Ronde, Clearwater, Salmon, and Imnaha rivers (NWFSC 2015).

In addition, ESA-listed Snake River spring Chinook and Snake River sockeye populations are unlikely to be encountered since their life history and migration timing makes their presence in the FMEP area when steelhead fisheries are active very unlikely (Figure 3).

Summer steelhead originating from the Salmon River MPG will also be subject to incidental handling in the Snake River between the Oregon/Washington state line and the mouth of the Salmon River (12 miles). Access to this section of the Snake River is restricted; therefore, Oregon angler effort is very limited in this area relative to that observed in the Snake River below Hells Canyon Dam, the Grande Ronde River or the Imnaha River.

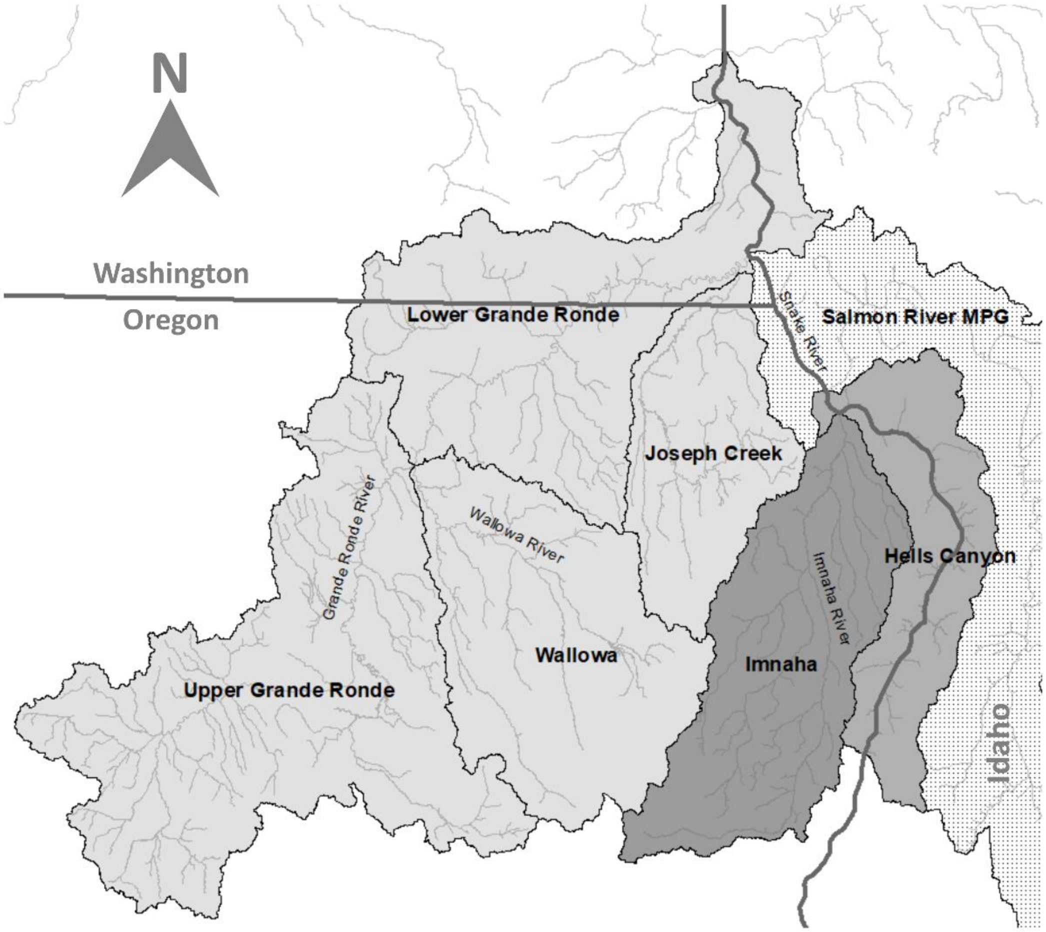

Figure 2. Steelhead populations within the Grande Ronde and Imnaha Major Population Grouping (MPG), as determined by the Interior Columbia Technical Recovery Team (ICTRT 2003).

Table 1. Population units within the Grande Ronde and Imnaha MPG that may be encountered in fishery areas described in Section 1.2.1.

Fishery Area (see Section 1.2.1)	Population/MPG					
	Summer Steelhead					Fall Chinook
	Lower Grande Ronde R.	Joseph Cr.	Upper Grande Ronde R.	Wallowa R.	Imnaha R.	Snake R.
Lower Grande Ronde R.	✓		✓	✓		✓
Wenaha R.	✓					✓
Upper Grande Ronde R.			✓			
Catherine Cr.			✓			
Wallowa R.				✓		
Imnaha R.					✓	✓
Big Sheep Cr.					✓	
Snake R.[a]					✓	✓

[a] The Snake River fishery below the Imnaha River has the potential of encountering Salmon River MPG steelhead that may overshoot the mouth of the Salmon River.

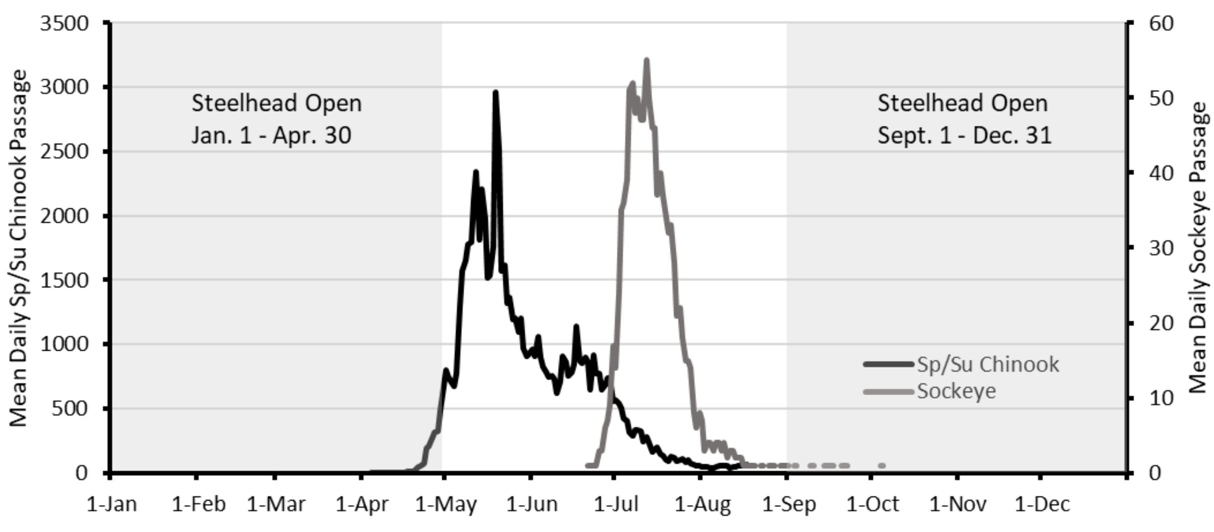

Figure 3. Mean daily counts of spring/summer Chinook and Sockeye salmon at Lower Granite Dam from 2008 to 2017, with open steelhead fishery periods within the FMEP area.

1.3.1 Description of “critical” and “viable” thresholds for each population (or management unit) consistent with the concepts in the technical document “Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units.”

The ICTRT incorporated minimum abundance thresholds (MAT) for abundance into population viability models, based on the demographic and genetic rationale provided by McElhany et al. (2000). Acknowledging that populations of listed Chinook and steelhead within Interior Columbia ESUs vary considerably in terms of the total area available to support spawning and rearing, these minimum abundance thresholds reflect estimates of the relative amount of historical spawning and rearing habitat associated with each population (ICTRT 2007). One of four population size categories (Basic, Intermediate, Large, and Very Large) were applied to each population based on a weighted estimate of the total habitat historically available (Weighted Area Category, Table 2; ICTRT 2007).

The ICTRT (2007) considered a minimum abundance of 500 spawners within ‘Basic’ populations adequate for compensatory processes to operate and to maintain within-population spatial structure for smaller populations. In addition, they noted populations with fewer than 500 individuals are at higher risk for inbreeding depression and other genetic concerns (McElhany et al. 2000). Incrementally higher MAT levels were established for the larger population size categories that considered utilization of multiple spawning areas, avoiding low population densities, and maintaining populations at levels where compensatory processes are functional (ICTRT 2007). Table 2 describes population size categories and associated MAT levels for Snake River steelhead and Snake River fall Chinook populations affected by this FMEP. Because minimum abundance thresholds consider each population’s capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment, we consider the MAT level to be synonymous with the ‘Viable’ threshold for each population (NMFS 2017a).

Table 2 also provides a ‘critical’ threshold that describes the level of abundance at which a population would be at high risk of extinction over a short time period. We calculate the critical abundance threshold as 30% of the population’s MAT level, or 150 spawners for a ‘Basic’ population, 300 spawners for an ‘Intermediate’ population, and 450 spawners for a ‘Large’ population, similar to recommendations for spring/summer Chinook salmon of the Biological Requirements Workgroup (BRWG 1994).

For Snake River fall Chinook, the ICTRT recommended a minimum abundance threshold of 3,000 natural spawners for extant Snake River fall Chinook salmon population (ICTRT 2007). However, due to the extirpation of the largest spawning areas above Hells Canyon Dam, Snake River fall Chinook are managed as a single population (below Hells Canyon Dam) with an integrated hatchery program. Based on this single-population scenario, the recovery plan chose a more conservative threshold that required the population to achieve ‘highly viable’ status and established a minimum abundance threshold of 4,200 natural spawners for the extant Snake River fall Chinook population (NMFS 2017b). As described above, we use the MAT level to describe a ‘Viable’ threshold and 30% of this value as the ‘Critical’ abundance threshold.

Table 2. Snake River steelhead and fall Chinook populations affected by Oregon recreational steelhead fisheries, including "Viable" and "Critical" Abundance Thresholds as described by BRWG (1994), ICTRT (2007), NMFS (2017a), and NMFS (2017b). For purposes of this document, ODFW uses the Minimum Abundance Threshold (MAT) as the Viable Threshold.

Major Population Group (MPG)	*Population*	*Weighted Area (Size) Category*	*Complexity*		*Minimum Abundance Thresholds (Viable; MAT)*	*Critical Abundance Threshold (30% MAT)*
			Category	*No. Major (Minor) spawning areas*		
Snake River Steelhead						
Grande Ronde River	Lower Grande Ronde	Intermediate	Dendritic	2 (5)	1,000	300
	Joseph Creek	Basic	Dendritic	3 (3)	500	150
	Wallowa River	Intermediate	Dendritic	4 (2)	1,000	300
	Upper Grande Ronde	Large	Dendritic	6 (7)	1,500	450
Imnaha River	Imnaha River	Intermediate	Dendritic	4 (3)	1,000	300
Hells Canyon	Tributaries below Hells Canyon Dam	*Extirpated; tributaries do not appear large enough to support an independent population*				
Snake River Fall Chinook						
Snake River	Lower Mainstem	*Not available*		5 (-)	4,200	1,260

1.3.2 Description of the current status of each population (or management unit) relative to its "Viable Salmonid Population thresholds" described above. Include abundance and/or escapement estimates for as many years as possible.

Snake River Steelhead

Spawning area redd counts conducted by ODFW and partner agencies, in some areas since the 1960s, provide the best source of long-term spawner abundance data for steelhead from the Grande Ronde and Imnaha MPGs. In particular, within the upper Grande Ronde and Joseph Creek populations, redd counts completed at representatively distributed index spawning reaches were combined with estimates of available spawning habitat and number of spawners per redd to generate adult escapement estimates (Figure 4). These datasets are unique, as long-term population level abundance information is limited for other Snake River steelhead MPGs. Therefore, the upper Grande Ronde and Joseph Creek populations are often referenced in DPS-wide assessments of abundance and productivity for the Snake River steelhead (NWFSC 2015).

Long-term abundance information for the Wallowa, Lower Grande Ronde, and Imnaha River populations are limited to redd counts conducted intermittently or within one or few spawning tributaries. Weir counts at select tributaries that have hatchery collection facilities (i.e., Deer Creek, Cottonwood Creek, Spring Creek, and Little Sheep Creek) provide additional information on natural returns. However, either method, or a combination of the two, are not representative enough to provide population-level abundance estimates. In addition, reliance on redd counts can be difficult due to inter-annual variations in survey conditions that may include high and turbid flows, inconsistencies in surveyor experience, and variations in steelhead redd morphometrics.

To increase the scope and quality of escapement estimates across the Snake River steelhead DPS, additional monitoring programs were established to provide more comprehensive estimates of natural spawner abundance at the MPG and population level. These monitoring projects utilize representative sampling of adult steelhead returns trapped at Lower Granite Dam, the uppermost mainstem dam that most steelhead MPGs (with exception of the Tucannon population of the Lower Snake River MPG) migrate past before reaching major tributaries. For example, the Integrated Status and Effectiveness Monitoring Program (ISEMP) uses a sample of PIT tagged natural steelhead, combined with subsequent detections of those adults at in-stream arrays to estimate tributary-specific abundance estimates (See et al. 2016, Orme and Kinzer 2018). In addition, the Snake River Basin Run Reconstruction project uses Genetic Stock Index (GSI) sampling at Lower Granite Dam to model the abundance, spatial distribution, and known fates/disposition of adult natural Snake River steelhead (Copeland et al. 2013, Copeland et al. 2014, Copeland et al. 2015, Stark et al. 2016, Stark et al. 2017, Stark et al. 2018).

For the Imnaha MPG, these recent efforts provide population-level escapement estimates that are also relatively consistent over time between methodologies (Figure 5, Table 3). Within the Grande Ronde MPG, modeling results from the run reconstruction project help fill in abundance estimates for less-understood populations (Lower Grande Ronde and Wallowa) without regular long-term monitoring (Table 3). However, these two MPGs were determined to have relatively high genetic stock misclassification rates (NWFSC 2015), which can generate abundance estimates much different from traditional redd count expansions (Upper Grande Ronde and Joseph Creek, Figure 5 and Table 3). While these limitations preclude developing reliable direct estimates of annual escapements for these individual populations (NWFSC 2015), they are still applicable at the MPG-level.

Utilizing the best available information, the most recent status review conducted by the Northwest Fisheries Science Center (2015) provides the most comprehensive summary regarding the status of Snake River steelhead populations relative to viability metrics described in section 1.3.1 above. Overall, the review did not indicate a change in the ESA listing status of Snake River steelhead, and found that four out of the five MPGs were not meeting the specific objectives in the recovery plan. However, the Grande Ronde MPG was tentatively rated as 'viable' but more information was needed on adult abundance and hatchery spawners in the Lower Grande Ronde and Wallowa River populations. Modeled adult abundance estimates utilized in the status review for two populations are provided in Figure 6, and a summary of risk and viability ratings are provided in Table 4. An excerpt of the NWFSC (2015) review of the Grande Ronde River MPG is provided below:

"Improvements in natural production are planned for all four populations in this MPG. Given their current status, it is expected that Joseph Creek and the Upper Grande Ronde River populations are the most likely to satisfy the MPG level requirement for one highly viable and one viable population. Although the average abundance levels have dropped from the prior review period, the paired geometric mean natural origin spawner abundance and productivity estimates for both populations exceed the 1% viability curves for their respective size categories (Basic and Large respectively). One of the aggregate natural origin stock groups identified based on genetic sampling at Lower Granite Dam includes all four Grande Ronde populations (e.g., Copeland et al. 2015). While, the relatively high misclassification rates associated with this group precluded developing reliable direct estimates of annual escapements for this group for use in this review, the results indicate that the estimated returns to Joseph Creek and the Upper Grande Ronde would account for the majority of the aggregate Grande Ronde run. The ICTRT assigned the Wallowa and Lower Grande Ronde populations a moderate A/P risk rating reflecting the general level of returns of A run steelhead, subarea weir and redd

counts. More specific data on annual returns would be needed to assign updated specific abundance and productivity ratings to these two populations.

All four populations in this MPG were assigned Low risk ratings for combined spatial structure and diversity in previous reviews (Ford et al. 2011). Preliminary analyses based on the Lower Granite Dam genetic stock identification project, combined with initial brood returns from the parental based tagging program, suggest that hatchery fish may be contributing to spawning in the Lower Grande Ronde and the Wallowa population at significant levels (Copeland et al. 2015). More information on the relative distribution and levels of contribution would be useful. At this time, the risk ratings for hatchery contributions to those two programs are increased to moderate.

The Grande Ronde Steelhead MPG is tentatively rated as achieving viable status. One population (Joseph Creek) is Highly Viable, the Upper Grande Ronde population meets the criteria for Viable, and the remaining two populations are provisionally rated as Maintained. Efforts are underway that might lead to population specific abundance and productivity series for those two populations and to a more explicit understanding of the relative distribution of hatchery spawners."

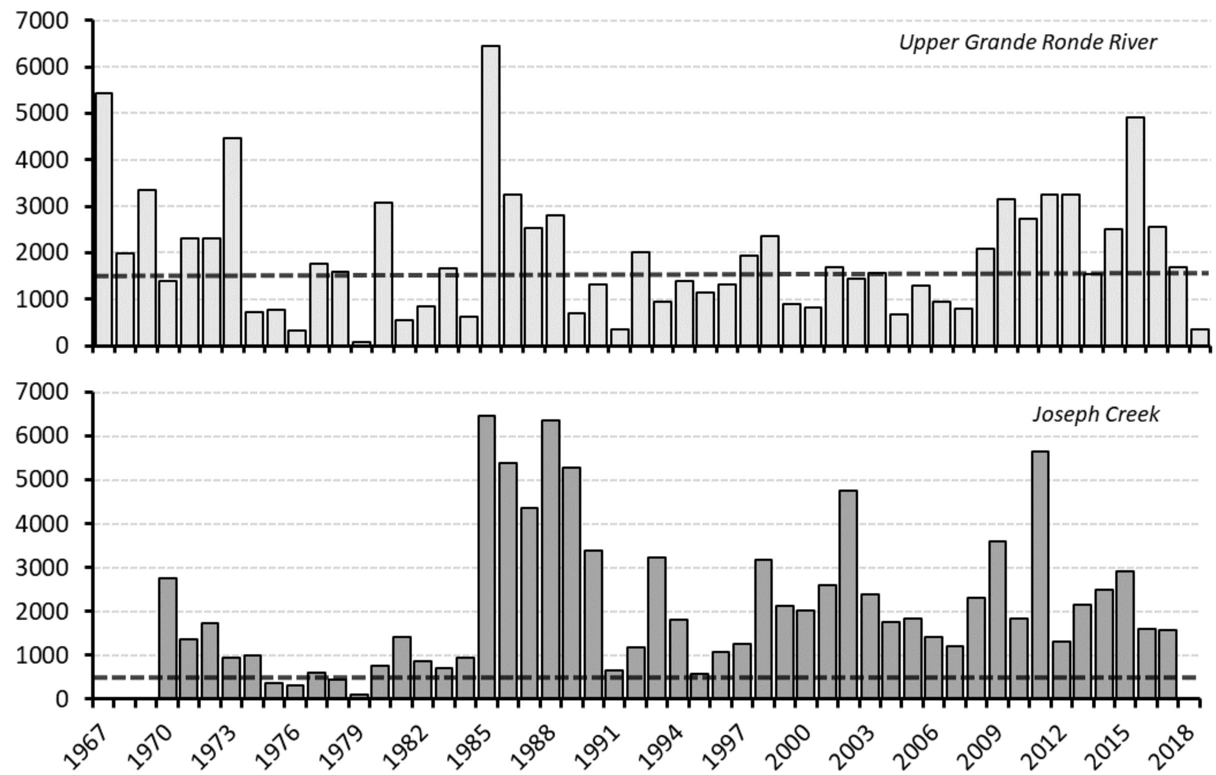

Figure 4. Estimated abundance of natural steelhead returning to the upper Grande Ronde River and Joseph Creek populations, derived from redd counts in select index survey reaches within spawning areas 1967-2018. Dashed line represents the minimum abundance threshold (MAT) for each population (ICTRT 2007). Data can be found at:
http://www.odfwrecoverytracker.org/explorer/species/Steelhead/run/summer/esu/271/292/

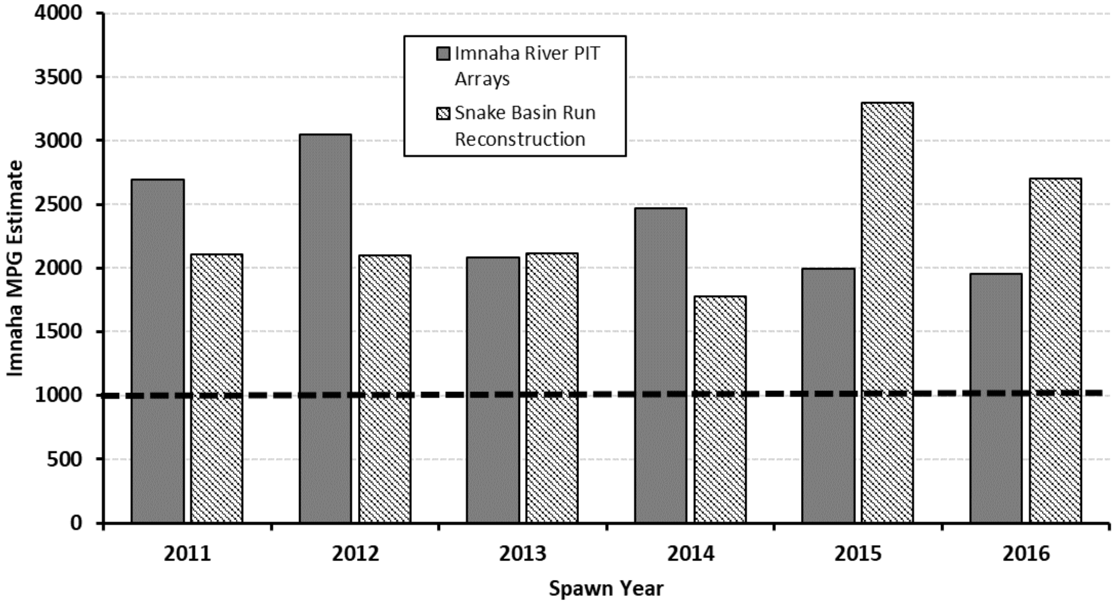

Figure 5. Estimated returns of natural steelhead to the Imnaha River Major Population Grouping (MPG), based on in-stream PIT tag arrays (See et al. 2016, Orme and Kinzer 2018) and Snake River Basin steelhead run reconstruction methodologies (Copeland et al. 2013, 2014, 2015, and Stark et al. 2016, 2017, 2018). Dashed line indicates the Minimum Abundance Threshold (MAT) for the Imnaha MPG.

Table 3. Estimated returns of natural steelhead to the Grande Ronde and Imnaha River Major Population Groupings (MPGs) based on Snake River Basin steelhead run reconstruction methodologies (Copeland et al. 2013, 2014, 2015, and Stark et al. 2016, 2017, 2018).

	Population				MPG Total	
Spawn Year	Lower Grande Ronde	Joseph Creek	Wallowa River	Upper Grande Ronde River	Grande Ronde River MPG	Imnaha River MPG
2011	1,137	828	2,266	2,728	**6,959**	**2,103**
2012	1,083	790	2,160	2,602	**6,635**	**2,099**
2013	918	668	1,788	2,203	**5,577**	**2,116**
2014	1,007	734	2,007	2,417	**6,165**	**1,777**
2015	1,851	1,348	3,687	4,441	**11,327**	**3,301**
2016	1,418	1,033	2,759	3,405	**8,615**	**2,701**

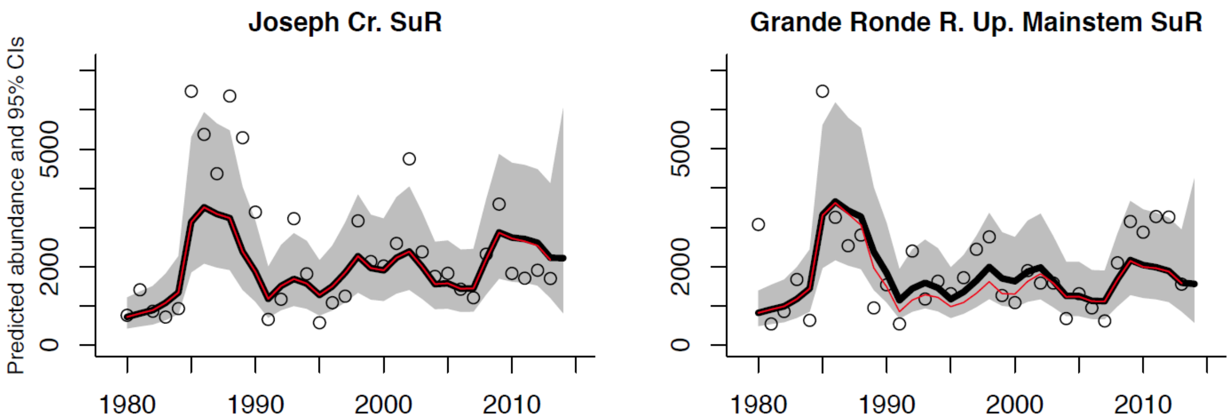

Figure 6. Smoothed trend in estimated total (thick black line) and natural (thin red line) population spawning abundance for the Joseph Creek and upper Grande Ronde River populations (from NWFSC 2015).

Table 4. Summary of Snake River steelhead and fall-run Chinook populations that pertain to this FMEP, relative to the criteria established by the ICTRT (2007). Reproduced from NWFSC (2015). Risk and viability ratings that include (?) are based on little or provisional data.

	Abundance / Productivity Metrics				Spatial Structure and Diversity Metrics			
Population	**Minimum Abundance Threshold (MAT)**	**Natural Spawning Abundance (10-year geomean)**	**Productivity**	**Integrated A/P Risk**	**Natural Processes Risk**	**Diversity Risk**	**Integrated SS/D Risk**	**Overall Viability Rating**
Grande Ronde Steelhead MPG								
Lower Grande Ronde River	1,000	N/A	N/A	N/A	Low	Moderate	Moderate	**Maintained (?)**
Joseph Creek	500	1,839	1.86	Very Low	Very Low	Low	Low	**Highly Viable**
Upper Grande Ronde River	1,500	1,649	3.15	Moderate	Very Low	Moderate	Moderate	**Viable**
Wallowa River	1,000	N/A	N/A	High (?)	Very Low	Low	Low	**Moderate (?)**
Imnaha River Steelhead MPG								
Imnaha River	1,000	N/A	N/A	Moderate	Very Low	Low	Low	**Moderate (?)**
Snake River Fall Chinook ESU								
Lower Mainstem	4,200	6,418	1.53	Low	Low	Moderate	Moderate	**Viable**

The Northwest Fisheries Science Center (2015) also reviewed the Imnaha steelhead MPG relative to viability metrics described in section 1.3.1. As a single population MPG, Imnaha River will need to meet a 'highly viable' status in order to be rated as 'viable' under the basic ICTRT criteria. Long-term abundance information was not available for the Imnaha; however, recent estimates suggest natural escapement estimates exceed the population minimum abundance threshold (MAT) in most years. A summary of risk and viability ratings for the Imnaha MPG are provided in Table 4, and the NWFSC (2015) review of the Imnaha MPG continues to state:

"The Imnaha River Steelhead population was rated as maintained in the prior review, based on moderate ratings for abundance and productivity (average A run surrogate) and spatial structure/diversity. The Imnaha

River constitutes one of the stock groups identified in the Lower Granite genetic stock identification program, although it is one of the stock groups with relatively high misclassification potential (Table 28). For that reason we have not explicitly adopted an extrapolated time series for this population. However, the general results from the genetic stock identification project to date and the two available annual PIT tag based estimates of steelhead returns into the Imnaha River (2011 and 2012 spawning years) suggest that natural production may be exceeding the ICTRT minimum threshold of 1,000 for this population. Information from the PBT hatchery study indicates that the number of hatchery returns from Imnaha River releases that remain available to spawn after harvest and weir removals may be substantial. While it is likely that those returns are concentrated in one section of the population (Big Sheep Creek), the relative distribution of hatchery and natural spawners is uncertain. Estimates of hatchery proportions in the upper end of the mainstem Imnaha are relatively low (Harbeck et al. 2015), but there is uncertainty about proportions in the lower mainstem Imnaha River.

Based on the information currently available, the Imnaha steelhead population is not meeting the Highly Viable rating for a single population MPG called for in the draft Snake River Recovery Plan. Achieving a Highly Viable rating would require achieving a Very Low risk rating for abundance and productivity and a Low overall risk rating for spatial structure and diversity. It is possible that additional years information from the PIT tag array project and/or refinements to the genetic stock identification program will result in improved estimates in future reviews. Additional information on the relative distribution of hatchery spawners could change the current diversity risk rating."

Snake River Fall Chinook

Spawner abundance and productivity metrics are based on counts and sampling of adult fall Chinook at Lower Granite Dam, in addition to Coded Wire Tag recoveries and Passive Integrated Transponder (PIT) tag detections. Natural escapement estimates have been generated by simply subtracting estimates of hatchery-origin returns from the total (Young et al. 2012), but Parental Based genetic Tagging (PBT) is currently allowing for more direct estimates of natural returns. The Northwest Fish Science Center (2015) assessed the Lower Snake Mainstem population as 'viable' using a 10-year (2005-2014) geomean natural adult abundance of 6,418, which is above the MAT level of 4,200. However, the Lower Mainstem Snake River fall Chinook are the only remaining population in the Snake River fall Chinook ESU, representing only 20% of the total historical habitat available (Dauble et al. 2003). Under a single-population delisting scenario, the population would need to meet or exceed minimum requirements for 'Highly Viable' with a high degree of certainty. The abundance dataset used for the most recent status review is shown in Figure 7, and a summary of risk and viability ratings are provided in Table 4. A more detailed summary of the NWFSC (2015) status review is below:

"The current rating described above is based on evaluating current status against the criteria for the aggregate population. The overall risk rating is based on a low risk rating for abundance/productivity and a moderate risk rating for spatial structure/diversity. For abundance/productivity, the rating reflects remaining uncertainty that current increases in abundance can be sustained over the long run. The geometric mean natural abundance for the most recent 10 years of annual spawner escapement estimates (2005-2014) is 6,418 fish. Using the ICTRT simple 20-year R/S method, the current estimate of productivity for this population (1990-2009 brood years) is 1.5. Given remaining uncertainty and the current level of variability, the point estimate of current productivity would need to meet or exceed 1.70, which is the present potential metric for the population to be rated at very low risk. While natural-origin spawning levels are above the minimum abundance threshold of 4,200, and estimated productivity is also high, the estimates are not high enough to account for the uncertainty buffer needed to achieve a rating of very low risk.

For spatial structure/diversity, the moderate risk rating was driven by changes in major life history patterns, shifts in phenotypic traits, and high levels of genetic homogeneity in samples from natural-origin returns. In particular, the rating reflects the relatively high proportion of within-population hatchery spawners in all major spawning areas and the lingering effects of previous high levels of out-of-ESU strays. In addition, the potential for selective pressure imposed by current hydropower operations and cumulative harvest impacts contribute to the current rating level.

Given the information available in 2015, an increase in estimated productivity (or a decrease in the year-to-year variability associated with the estimate) would be required, assuming that natural-origin abundance of the single extant Snake River fall Chinook salmon population remains relatively high. An increase in productivity could occur with a further reduction in mortalities across life stages. Such an increase could be generated by actions such as a reduction in harvest impacts (particularly when natural-origin spawner return levels are below the minimum abundance threshold) and/or further improvements in juvenile survivals during downstream migration. It is also possible that survival improvements resulting from actions (e.g., more consistent flow-related conditions affecting spawning and rearing, and increased passage survivals resulting from expanded spill programs) in recent years have increased productivity, but that increase is effectively masked as a result of the relatively high spawning levels in recent years. A third general possibility is that productivity levels may be decreased over time as a result of negative impacts of chronically high hatchery proportions across natural spawning areas. Such a decrease would also be largely masked by the high annual spawning levels.

Diversity: To achieve highly viable status with a high degree of certainty, the spatial structure/diversity rating needs to be low risk. This status assessment used the ICTRT framework for evaluating population-level status in terms of spatial structure and diversity organized around two major goals: maintaining natural patterns for spatially mediated processes and maintaining natural levels of variation (ICTRT 2007).

For a single population scenario, achieving low risk for spatial structure/diversity would require that one or more major spawning areas produce a significant level of natural-origin spawners with low influence by hatchery-origin spawners relative to the other major spawning areas. At present (escapements through 2014), given the widespread distribution of hatchery releases and hatchery origin returns across the major spawning areas within the population, and the lack of direct sampling of reach-specific spawner compositions, there is no indication of a strong differential distribution of hatchery returns among major spawning areas.

Overall, the status of Snake River fall Chinook salmon has clearly improved compared to the time of listing and compared to prior status reviews. The single extant population in the ESU is currently meeting the criteria for a rating of "viable" developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Dam complex (NMFS 2015b)."

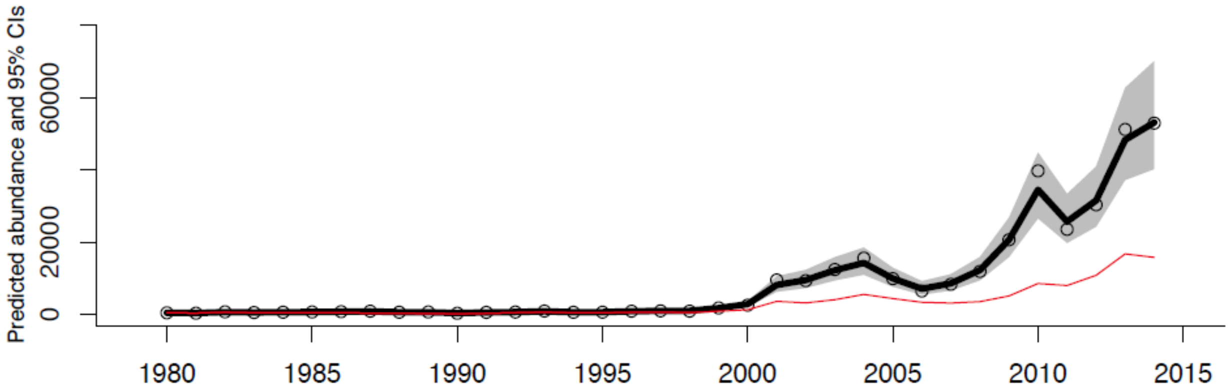

Figure 7. Smoothed trend in estimated total (thick black line) and natural (thin red line) population spawing abundance for Snake River fall-run ESU. Points show the annual raw spawning abundance estimates (from NWFSC 2015).

1.4 Harvest Regime

1.4.1 Provide escapement objectives and/or maximum exploitation rates for each population (or management unit) based on its status.

ODFW proposes to manage fisheries based on a fixed impact rate for each Major Population Group (MPG). In the Snake River basin upstream of Ice Harbor Dam, steelhead MPGs are delineated by major drainages (Lower Snake, Clearwater, Grande Ronde, Imnaha, and Salmon Rivers). The population within the minor tributaries of the Snake River in Hells Canyon (upstream from the Imnaha River to Hells Canyon Dam) are determined to be functionally extirpated (NWFSC 2015) and will not be considered when calculating impact rates from recreational steelhead fisheries in Hells Canyon.

Total natural steelhead returns to each MPG will be estimated at Ice Harbor Dam (ICH), the nearest mainstem dam to the Snake River mouth. Total natural steelhead returns to Ice Harbor are generated using estimates of total natural returns at Lower Granite Dam (LGD), combined with estimated conversion (survival) rates between ICH and LGD. Allocating the total return estimate to each MPG incorporates information from the Snake River Basin Steelhead Run Reconstruction model, which is produced by a highly coordinated interagency workgroup including all Snake Basin co-managers. This model is specifically designed to estimate the abundance of steelhead that return to the Snake River basin, the spatial distribution of spawning fish, and known fates/disposition (Stark et al. 2018). The total estimate at ICH is apportioned to each MPG as determined by Genetic Stock Index (GSI) sampling of adult steelhead at Lower Granite Dam (Stark 2018). For example, from 2013 to 2017 the Grande Ronde and Imnaha MPG accounted for, on average, 26% and 8% of the total natural steelhead return to the Snake River Basin, respectively (Table 6, Camacho et al. 2017).

Natural steelhead cannot be legally harvested within the Snake River Basin; therefore, we estimate the number of encounters (i.e., catch-and-release events) of natural steelhead using a statistical creel survey. ODFW conducts angler creel surveys annually in the Grande Ronde and Imnaha River steelhead fisheries with funding support from the LSRCP and the Bonneville Power Administration (BPA). Surveys are structured both spatially and temporally to sample fisheries during periods of high angler use and steelhead presence. For example, the Lower Grande Ronde fishery is sampled during fall months, and the Wallowa and Imnaha Rivers are sampled during spring months (Flesher and Clarke 2018). For details on sampling and estimation methods, see Flesher and Clarke (2018) at: https://www.fws.gov/lsnakecomplan/Reports/ODFWreports.html.

Natural steelhead impacts are estimated by applying an incidental mortality rate (i.e, catch-and-release mortality) to the total estimate of natural steelhead encounters for each MPG. This incidental mortality, oftentimes referred to as 'hooking mortality', typically occurs within the first 24-48 hours of an encounter and results from hooking injuries in tissue or organs that result in severe blood loss immediately following release (Mongillo 1984, Muoneke and Childress 1994). We propose to adopt an incidental mortality rate of 5.0%, consistent with determinations from NMFS and NOAA (1999 and 2000) as the best available estimate for natural steelhead for selective fisheries. The basis for this determination was cited in Hooton (1987), who estimated a 5.1% catch and release mortality for 336 adult winter steelhead caught with all gear types. The Hooton (1987) findings were supported by a more recent study by Nelson et al. (2005) that estimated an average incidental mortality of 3.6%, from a sample of 226 steelhead. Furthermore, Twardek (2018) found that survival of steelhead from the Bulkley River was estimated at 95.5% (mortality of 4.5%) within the first three days of a capture event.

Recent collections of hatchery steelhead broodstock using anglers suggest the 5.0% incidental mortality rate estimate may be higher than the actual mortality within the FMEP area. ODFW collected 410 adult hatchery steelhead in the lower Grande Ronde River during early October from 2004 to 2007 by volunteer anglers with bait, lures, jigs, and flies. Of the 410 adult hatchery steelhead caught, only seven (7) died for an incidental mortality rate of 1.7% (ODFW Wallowa District). Idaho Fish and Game (IDFG) recently assessed pre-spawn mortality of hatchery steelhead collected for broodstock by anglers in the South Fork Clearwater River, and found mortality by angling was less than 3% among a sample size of 654 adult steelhead (Whitney et al. in press).

Table 5. Major Population Group impact rates and low-abundance triggers for ESA-listed natural steelhead from fisheries in the Snake River Basin in terms of adult passage above Ice Harbor Dam.

MPG	Critical Abundance Threshold (CAT)[1]	Minimum Abundance Threshold (MAT)	Proposed natural impact rate (%)[2]
Grande Ronde	1,200	4,000	10
Imnaha	300	1,000	5

[1] When abundance at Ice Harbor Dam is predicted to be below this threshold for a specific MPG, fishery managers will discuss with NMFS any fishery modifications to limit impacts for the MPG.

[2] Collective impacts on steelhead adults from all other tribal treaty and recreational fisheries.

Table 6. Proportion of the total Snake River Basin natural steelhead return from the Grande Ronde and Imnaha River MPG, as determined from Genetic Stock Index sampling of adult steelhead at Lower Granite Dam 2013-2017 (Camacho et al. 2017).

	Proportion of Total Snake River Basin natural steelhead return (%)	
Run Year	Grande Ronde	Imnaha
2013	24.4	7.1
2014	24.3	9.3
2015	22.3	7.6
2016	25.1	7.7
2017	33.2	6.4
Average (±SD)	25.9 ± 4.2	7.6 ± 1.1

1.4.2 Description of how the fisheries will be managed to conserve the weakest population or management unit.

Fisheries in the management area defined in section 1.2.1 specifically targets hatchery production that exceeds the broodstock needs of congressionally mandated mitigation goals of federal and private (i.e., IPC) hatcheries. To meet those objectives while minimizing impacts to natural steelhead populations ODFW utilizes several management tools, categorized below and as outlined in the Northeast and Snake River Zones within the Oregon sport fishing regulations (ODFW 2018):

<u>Mark-selective harvest</u> – Harvest of adult steelhead within the fishery management areas is restricted to hatchery fish only, as evidenced by an external mark (i.e., a healed adipose clip scar). ODFW requires the immediate, unharmed, release of natural unmarked steelhead. Within fishery management areas downstream of steelhead smolt release sites (sections of the Grande Ronde, Wallowa, Imnaha Rivers, and Big Sheep Creek), ODFW also requires the release of natural unmarked rainbow trout. This regulation intends to encourage harvest of residual hatchery steelhead, thus reducing direct impacts to natural juvenile steelhead through harvest and indirect impacts from competition with residualized hatchery smolts.

<u>Spatial closures</u> – Steelhead angling is closed in all waters within the Northeast and Snake River Zones, unless noted under specific exceptions (ODFW 2018) that correspond with the fishery management areas described in section 1.2.1 (Figure 1). Steelhead are distributed across 2,185 stream miles within the Grande Ronde, Imnaha, and Oregon Snake River Subbasins, of which only 314 miles (14%) are open for steelhead fishing. While most natural steelhead populations are subject to encounters in certain Oregon steelhead fisheries (see section 1.3), the Joseph Creek (Grande Ronde MPG) population is entirely protected from steelhead angling impacts within Oregon.

Fishery management areas in the Grande Ronde River (downstream of the Wallowa River), the Wallowa River, Imnaha River, and Big Sheep Creeks are located within the migratory corridor of hatchery steelhead returning to smolt release and adult collection sites on Deer and Spring Creeks, tributaries to the Wallowa River; and Little Sheep Creek, tributary to Big Sheep Creek (Figure 1). The vast majority of natural steelhead spawning and rearing areas are precluded from steelhead angling. Fishery management objectives for the Grande Ronde River (upstream of the Wallowa River), Wenaha River, and Catherine Creek are to remove hatchery steelhead that stray into natural production areas (Figure 1), thus reducing interaction between natural and hatchery steelhead.

Temporal closures – The fishery management areas described in section 1.2.1 open on September 1 and close on April 30 annually. Although spawning largely occurs outside of the fishery management areas, the April 30 closure date intends to avoid impacts to spawning adults where present and/or post-spawn kelts migrating downstream.

Gear restrictions – In select tributaries and waterbodies, gear restrictions further limit incidental fishery-related mortality. The Oregon Sport Fishing Regulations specify a suite of gear restrictions that include, but are not limited to:

- Use of artificial flies and lures in streams. Exceptions apply to most stream sections where annual hatchery steelhead seasons occur. Investigations into hooking mortality studies indicates that trout caught with bait have a significantly higher associated mortality rate (Taylor & White 1992). By limiting the use of bait in tributaries where resident trout and juvenile steelhead rear, angling associated mortality is reduced.

- Require use of single and multi-point hooks with gaps less than 1" and 9/16," respectively, when angling for steelhead. Mortality rates between single and multi-point hooks vary widely depending on the type terminal tackle being used, and hook size effects often depend on the size of the fish being caught (Muoneke and Childress 1994). However, the size of hook has been positively correlated with foul hooking rates and mortality in brown trout (Hulbert and Engstrom-Heg 1980), though studies that examine the effects of foul hooking are limited (Taylor and White 1992). Despite these limitations, it can be assumed that foul-hooking steelhead with large hooks can result in injuries and increased mortality. Hook gap restrictions intend to reduce accidental foul hooking and illegal snagging (purposefully foul-hooking fish).

- Prohibiting landing steelhead with gaff, spear, or club. Using methods to land steelhead that inflict severe trauma or instantaneous mortality, such as gaffing, spearing, or clubbing, is not legal in Oregon steelhead fisheries. By precluding these landing methods, anglers can selectively release juvenile and adult steelhead with a high likelihood of survival.

- Use of barbless hooks (i.e., while angling for steelhead in the Snake River).

Critical abundance thresholds - The critical abundance threshold (CAT) is defined as 30% of the aggregated MPG MAT value, as apportioned for each MPG determined by the average GSI proportions from 2013 to 2017 at Ice Harbor Dam (ICH, see Section 1.3.1). When natural steelhead forecasts fall below the CAT level, fishery managers will consider management actions to reduce incidental mortality on natural stocks (see Section 3.5.1).

1.4.3 Demonstrate that the harvest regime is consistent with the conservation and recovery of commingled natural-origin populations in areas where artificially propagated fish predominate.

Consistent with Section 1.4.2 above, harvest of adult steelhead within the fishery management areas is restricted to hatchery fish only, as evidenced by an external mark (i.e., a healed adipose clip scar). Current production agreements mark 100% of hatchery steelhead with an adipose clip (U.S. vs. Oregon 2018). ODFW requires the immediate, unharmed, release of natural unmarked steelhead (ODFW 2018).

Substantial portions of the Grande Ronde and Imnaha basins are currently managed with no hatchery steelhead programs (e.g., Joseph Creek, upper and lower Grande Ronde, mainstem Imnaha, and Big Sheep Creek). Joseph Creek and the majority of spawning areas in other populations are closed to steelhead fishing, providing additional protection to natural steelhead.

As high fractions of hatchery spawners can pose risks to diversity and long- term productivity in the receiving populations (ICTRT 2007), harvest is one tool to manage for an acceptable proportion of hatchery spawners. In addition to managing harvest throughout the migratory corridor of artificially-produced steelhead, ODFW provides harvest opportunity where these fish stray into natural production areas (i.e., lower Wenaha River, upper Grande Ronde River) to manage hatchery influence in natural populations.

1.5 Annual Implementation of the Fisheries

The Oregon Fish and Wildlife Commission adopt the Oregon Sportfish Regulations by permanent rule on an annual basis (ODFW 2018). This includes the angling regulations pertaining to the steelhead fishery management areas described in Section 1.2. Additionally, the Oregon Fish and Wildlife Commission may adopt temporary or emergency rules that supersede permanent rules to provide additional opportunity or protection for steelhead. Coordination on fishing seasons and regulations takes place in a co-management forum including NOAA Fisheries, Tribal co-managers, and fishery managers from the States of Oregon, Idaho and Washington.

SECTION 2. EFFECTS ON ESA-LISTED SALMONIDS

2.1 Description of the biologically-based rationale demonstrating that the fisheries management strategies will not appreciably reduce the likelihood of survival and recovery of the affected ESU(s) in the wild.

2.1.1 Description of which fisheries affect each population (or management unit).

See Table 1, Section 1.3.

2.1.2 Assessment of how the harvest regime will not likely result in changes to the biological characteristics of the affected ESUs.

Collective mortality in tribal and recreational fisheries in the Snake River Basin represents a relatively minor loss compared with natural mortality and out-of-basin mortality factors. From 2010 to 2016, combined impacts for the Grande Ronde and Imnaha MPGs averaged 4.4% and 6.0%, respectively (Table 7). During the same timeframe, subsequent escapement after fisheries averaged 7,897 and 2,431 steelhead for the Grande Ronde and Imnaha MPGs, respectively. When compared to Minimum Abundance Thresholds (MAT) for the populations, natural escapement under current management regimes averages over twice (2.4 and 2.1, respectively) MAT levels for these populations. It should also be noted that estimates for the Imnaha population are likely high, as unclipped hatchery fish are included in estimates of natural loss during the 2010-11 and 2011-12 fisheries. Recent estimates after 2012 are more indicative of current impacts, and average 3.9% (Table 7).

Proposed maximum impact rates of 10% for the Grande Ronde and 5% for the Imnaha MPG are in most cases higher than current impact rates described. However, increasing impact rates to the maximum levels proposed above in section 1.4.1 would not cause significant changes to the demographic status of these populations. Using the same dataset from 2010 to 2016, but with maximum impact rates proposed instead, we estimate minor reductions in spawning escapement averaging 6% less than the current fishery regime for the Grande Ronde MPG. At the maximum impact rates proposed, subsequent natural escapement would remain just under twice (2X) MAT levels (Table 7). A similar assessment for the Imnaha is more difficult given recent variability in current impact rates, combined with high impact rates in 2010-2012 due to the presence of unclipped hatchery fish. However, based on the most recent four years we estimate a reduction in natural escapement of one percent (1%).

From a demographic standpoint, Snake River Basin fisheries do not lower abundance to a point that would elicit changes in the biological characteristics of these populations. During the current time series spawning escapement in both Grande Ronde and Imnaha MPGs is near or above twice the MAT level, suggesting that both populations are clearly replacing themselves (NWFSC 2015). The levels of abundance analyzed in this FMEP suggest that natural steelhead in the Grande Ronde and Imnaha MPGs can persist and grow under both current and proposed maximum fishery regimes. This recent analysis is also consistent with earlier analyses, as Chilcote (2001) suggested that natural steelhead populations examined within the Grande Ronde and Imnaha basins were viable under the existing described harvest regime and found that both populations were capable of sustaining modest increases in mortality. In addition, current or proposed maximum impact rates in Snake River Basin fisheries are low enough that we would not expect non-demographic characteristics of these populations (run timing, age structure, life histories) to change. Should abundance levels decline from levels analyzed under this FMEP, fishery managers will rely on the process outlined in Section 3.5.1 to adaptively manage fisheries to limit impacts to natural steelhead.

Table 7. Estimated natural steelhead returns and collective fishery mortality, including subsequent escapement compared with critical and minimum abundance thresholds (ICTRT 2007), under current and proposed maximum impact rates (Proposed Max) in Snake River Basin (SRB) fisheries 2010-2016 (Copeland et al. 2013, Copeland et al. 2014, Copeland et al. 2015, Stark et al. 2016, Stark et al. 2017, Stark et al. 2018).

Grande Ronde MPG								
			Impact Rate		*Escapement*		*Abudance Thresholds*	
Year	*Return to Ice Harbor Dam*	*Total SRB Fishery Loss*	*Current*	*Proposed Max*	*Current*	*Proposed Max*	*Critical*	*Minimum*
2010-2011	7354	269	3.7%	10.0%	7085	6619	1200	4000
2011-2012	7643	422	5.5%	10.0%	7221	6879	1200	4000
2012-2013	6067	375	6.2%	10.0%	5692	5460	1200	4000
2013-2014	6819	351	5.1%	10.0%	6468	6137	1200	4000
2014-2015	12404	249	2.0%	10.0%	12155	11164	1200	4000
2015-2016	9091	332	3.7%	10.0%	8759	8182	1200	4000

Imnaha MPG								
			Impact Rate		*Escapement*		*Abudance Thresholds*	
Year	*Return to Ice Harbor Dam*	*Total SRB Fishery Loss*	*Current*	*Proposed Max*	*Current*	*Proposed Max*	*Critical*	*Minimum*
2010-2011	2477	262	10.6%	5.0%	2215	2353	300	1000
2011-2012	2555	240	9.4%	5.0%	2315	2427	300	1000
2012-2013	2270	47	2.1%	5.0%	2223	2157	300	1000
2013-2014	1918	118	6.2%	5.0%	1800	1822	300	1000
2014-2015	3503	202	5.8%	5.0%	3301	3328	300	1000
2015-2016	2783	49	1.8%	5.0%	2734	2644	300	1000

2.1.3 Comparison of harvest impacts in previous years and the harvest impacts anticipated to occur under the harvest regime in this FMEP.

In addition to current and proposed maximum impact rates for collective Snake River Basin fisheries above Ice Harbor summarized above in Section 2.1.2, incidental mortality of natural steelhead with Oregon fisheries is estimated annually using statistical creel methods (Flesher and Clarke 2018). Estimated impact rates from 2006 to 2016 are summarized in Tables 8 and 9 using the total estimated encounters of natural steelhead, a 5% incidental mortality rate, and estimates of abundance at Lower Granite Dam (LGD) for each MPG reported by Camacho (2017).

For fisheries that occurred from 2006 to 2016 we estimate an average of 2,324 natural steelhead (range 1,205 to 4,592) from the Grande Ronde MPG are encountered by anglers annually, resulting in an average impact of 116 natural steelhead each year (range 60 to 230, Flesher and Clarke 2018). Natural steelhead abundance at LGD for Grande Ronde MPG steelhead averaged 6,804 during the same timeframe (Camacho 2017), resulting in an average impact rate within Oregon fisheries of 1.9% (range 0.8% to 3.2%, Table 8).

Table 8. Estimated harvest, encounters, and associated Grande Ronde River MPG impacts for steelhead fisheries the Grande Ronde Basin.

	Grande Ronde River MPG						
Run Year	Harvest (Marked Hatchery)	Released		Total Catch	Natural Impacts[a]	Total Natural Est. (LGD)	Natural Impact Rate
		Marked (Hatchery)	Unmarked (Natural)				
06-07[b]	2,600	1,559	1,392	5,551	70	2,158	3.2%
07-08[b]	4,359	3,190	1,467	9,016	73	3,214	2.3%
08-09	3,428	1,613	2,065	7,106	103	4,905	2.1%
09-10	8,218	4,866	4,592	17,676	230	8,443	2.7%
10-11	4,103	2,161	3,163	9,427	158	9,443	1.7%
11-12	3,592	1,954	3,518	9,064	176	9,329	1.9%
12-13	2,545	757	1,811	5,113	91	5,657	1.6%
13-14	1,292	417	1,205	2,914	60	6,168	1.0%
14-15	3,394	2,263	2,621	8,278	131	10,192	1.3%
15-16	903	492	1,410	2,805	71	8,530	0.8%
Mean	**3,443**	**1,927**	**2,324**	**7,695**	**116**	**6,804**	**1.9%**

[a] Calculated as 5% of the estimated natural encounters (see Section 1.4.1)

[b] Not a direct estimate, abundance calculated using natural steelhead counts at Lower Granite Dam (LGD) and the average ratio of Grande Ronde River to Snake River Basin steelhead escapement at LGD from 2009-2016 (Camacho 2017).

During the same timeframe, an average of 994 natural steelhead (range 119 to 4,481) were encountered annually in Oregon fisheries affecting the Imnaha MPG, resulting in average annual impacts of 50 natural steelhead each year (range 6 to 224, Flesher and Clarke 2018). However, unmarked hatchery fish were included in the estimate of natural steelhead from 2006 to 2012 (Flesher and Clarke 2018). This factor results in positive bias when calculating impact rates for the Imnaha MPG during those years. Recent estimates when unmarked hatchery fish were not present suggest much lower impacts averaging 13 per year (2012 to 2016).

During the complete series, natural abundance at LGD for the Imnaha MPG averaged 2,444 (Camacho 2017) resulting in an average impact rate of 2.0% (range 0.2% to 6.1%, Table 9). However, Camacho (2017) included unmarked hatchery fish when estimating abundance at LGD and those fish were also included in estimates of natural encounters. Looking at the most recent four years when unmarked hatchery fish were not present, impact rates on the Imnaha MPG resulting from Oregon steelhead fisheries averaged 0.5% per year (Table 9).

Table 9. Estimated angling encounters by mark type and associated impacts for the Imnaha River steelhead fishery.

Run Year	Imnaha River (MPG)						
	Harvest (Marked Hatchery)	Released: Marked (Hatchery)	Released: Unmarked (Natural)	Total Catch	Natural Impacts[a]	Total Natural Est. (LGD)	Natural Impact Rate
06-07[b,c]	225	70	465	760	23	770	3.0%
07-08[b,c]	443	338	1,572	2,353	79	1,147	6.9%
08-09[c]	319	108	638	1,065	32	1,916	1.7%
09-10[c]	736	519	4,481	5,736	224	3,693	6.1%
10-11[c]	466	188	1,500	2,154	75	3,318	2.3%
11-12[c]	126	71	238	435	12	3,489	0.3%
12-13	126	4	206	336	10	1,638	0.6%
13-14	106	23	279	408	14	2,369	0.6%
14-15	249	134	442	825	22	3,481	0.6%
15-16	75	38	119	232	6	2,617	0.2%
Mean	**287**	**149**	**994**	**1,430**	**50**	**2,444**	**2.2%**

[a] Calculated as 5% of the estimated natural encounters (see Section 1.4.1).

[b] Not a direct estimate, abundance calculated using natural steelhead counts at Lower Granite Dam (LGD) and the average ratio of Grande Ronde River to Snake River Basin steelhead escapement at LGD from 2009-2016 (Camacho 2017).

[c] "Released, Unmarked" fish includes hatchery steelhead with intact adipose fins. These fish were included in calculations of natural impacts that likely results in a positively biased impact estimations of impact.

Based on trends in steelhead abundance, fishing license sales, and other socio-economic factors influencing fishing participation we do not expect natural impacts to increase significantly in the future. Current management strategies that protect listed populations will continue (see Section 1.4.2), and we expect that coordinated monitoring efforts will help managers adapt to changes in abundance. If impact rates increased unexpectedly, the analysis presented above in Section 2.1.2 suggests that both MPGs could sustain additional impacts without changing the demographic status of the populations.

Impacts to natural Snake River Basin fall Chinook resulting from encounters in Idaho and Oregon recreational fisheries in the Snake River are summarized in Table 10. Together, Idaho and Oregon steelhead fisheries in the mainstem Snake River impact 0.33% of the total natural run at Lower Granite Dam from 2007-2016.

Table 10. Incidental mortality of natural fall Chinook salmon in Idaho and Oregon's state recreational steelhead fisheries in the Snake River: LGD; Lower Granite Dam (data source Idaho Fish and Game 2018).

Year	Fall Chinook Salmon (Natural over LGD)	Incidental Mortality (%)
2007	2,816	19 (0.67)
2008	2,995	12 (0.4)
2009	4,273	9 (0.21)
2010	7,347	15 (0.2)
2011	8,072	29 (0.36)
2012	11,306	18 (0.16)
2013	20,132	93 (0.46)
2014	11,899	32 (0.27)
2015	15,034	45 (0.3)
2016	8,762	19 (0.22)

2.1.4 Description of additional fishery impacts not addressed within this FMEP for the listed ESUs specified in section 1.3. Account for harvest impacts in previous year and the impacts expected in the future.

Steelhead from the Grande Ronde and Imnaha MPGs are intercepted in sport and commercial (non-Treaty) and tribal (Treaty) fisheries in the Columbia River; and sport (non-Treaty) and tribal (Treaty) fisheries in the Snake River before reaching tributaries outlined in this FMEP.

Non-treaty Columbia River fisheries from the mouth upstream to the I-395 bridge near the Snake River mouth and into the Snake River to the Washington/Idaho boarder are managed according to the 2018-2027 *U.S. vs. Oregon* Management Agreement, which sets a 4% maximum impact rate of Snake River Basin A-index steelhead (NMFS 2018). In this area Non-treaty impacts for A-index steelhead averaged 1.9% from 2008-2016 (NMFS 2018). Treaty fisheries in this area do not have a specific maximum impact rate on A-Index summer steelhead, although recent impacts from 2008 to 2016 run years averaged 8.1% (NMFS 2018). While direct estimates are not available, a genetic analysis estimated that 57% of natural steelhead harvested in Columbia River Treaty fisheries during 2012 estimated that were of Snake River origin (Byrne et al. 2014).

Snake Basin steelhead run reconstruction estimates suggest the vast majority of natural steelhead losses from the Grande Ronde and Imnaha occur in the Columbia River, representing 88% and 86% of the average annual losses (Copeland et al. 2013, Copeland et al. 2014, Copeland et al. 2015, Stark et al. 2016, Stark et al. 2017, Stark et al. 2018). From 2010 to 2016, approximately 25% and 26% of the total Grande Ronde and Imnaha MPG returns to Bonneville Dam were lost in the Columbia River, respectively (Table 11). However it should be noted that 'losses', as described by the run reconstruction modeling, is not limited to harvest and/or incidental impacts; but also includes straying and non-fishery sources of mortality.

Table 11. Estimated losses of Grande Ronde and Imnaha MPG steelhead within Columbia, Snake, and tributary rivers during run years 2010 to 2016 (Copeland et al. 2013, Copeland et al. 2014, Copeland et al. 2015, Stark et al. 2016, Stark et al. 2017, Stark et al. 2018).

			Estimated Losses				Proportion of Total Losses		
Run Year	MPG	Abundance at BON	Columbia River	Snake River	Tributary	Total N-O Losses	Columbia River	Snake River	Tributary
2010-2011	Grande Ronde	10,346	2,992	87	182	3,261	91.8%	2.7%	5.6%
2011-2012	Grande Ronde	9,391	1,747	93	329	2,169	80.5%	4.3%	15.2%
2012-2013	Grande Ronde	8,467	2,400	97	278	2,775	86.5%	3.5%	10.0%
2013-2014	Grande Ronde	9,003	2,184	307	44	2,535	86.2%	12.1%	1.7%
2014-2015	Grande Ronde	16,719	4,315	158	91	4,564	94.5%	3.5%	2.0%
2015-2016	Grande Ronde	11,942	2,851	132	200	3,183	89.6%	4.1%	6.3%
2010-2011	Imnaha	3,386	909	29	233	1,171	77.6%	2.5%	19.9%
2011-2012	Imnaha	3,128	573	33	207	813	70.5%	4.1%	25.5%
2012-2013	Imnaha	2,837	567	35	12	614	92.3%	5.7%	2.0%
2013-2014	Imnaha	3,029	1,111	118	0	1,229	90.4%	9.6%	0.0%
2014-2015	Imnaha	4,927	1,424	202	0	1,626	87.6%	12.4%	0.0%
2015-2016	Imnaha	3,821	1,038	43	6	1,087	95.5%	4.0%	0.6%

Snake River & Tributaries

Grande Ronde and Imnaha MPG steelhead are caught in tribal and recreational steelhead fisheries within the Snake River from the mouth upstream to tributaries. In addition, Grande Ronde MPG steelhead are caught within the Washington section of the Grande Ronde River before migrating into Oregon reaches covered under this FMEP. Since hatchery steelhead from Grande Ronde and Imnaha Rivers are harvested occasionally in other Snake River tributaries, such as the Clearwater River in Idaho, we expect some natural steelhead from these MPGs may be encountered at low rates.

Impacts and/or losses to natural steelhead from the Grande Ronde and Imnaha MPGs are relatively minor in the Snake River Basin, compared to impacts that occur in mainstem Columbia fisheries (Table 11). The mainstem Snake River between Ice Harbor and Lower Granite Dams account for 5.0% and 6.4% of the average annual losses incurred by the Grande Ronde and Imnaha MPGs, respectively (Table 11). Within-tributary losses account for 6.8% and 8.0% of average annual losses for Grande Ronde and Imnaha MPGs, respectively (Table 11; Imnaha estimate includes unclipped hatchery fish present in 2010-2012 and is likely lower on natural steelhead). Natural impacts within Washington sections of the Grande Ronde River average 62 steelhead per year, based on creel surveys conducted by ODFW and WDFW (Table 12; Bumgarner and Dedloff 2011, 2013, 2015, and Flesher unpublished).

Table 12. Estimated encounters and impacts (with a 5% mortality rate) of natural steelhead within the Washington section of the Grande Ronde River from 2006 to 2016 (Bumgarner and Dedloff 2011, 2013, 2015, and Flesher unpublished).

	Natural Encounters (Released)		
Year	Hwy. 129 to State Line	Near Mouth	Natural Impact[a]
2006-07	755	N/A	38
2007-08	396	N/A	20
2008-09	426	237	33
2009-10	2618	946	178
2010-11	1090	309	70
2011-12	1389	572	98
2012-13	880	201	54
2013-14	523	N/A	26
2014-15	908	N/A	45
2015-16	1232	N/A	62

[a] Calculated as 5% of the estimated natural encounters (see Section 1.4.1).

SECTION 3. MONITORING AND EVALUATION

3.1 Description of the specific monitoring of the "Performance Indicators" listed in section 1.1.1.

Tributary fishery performance indicators for steelhead including fishing effort, hatchery harvest, hatchery encounters (caught and released), and natural encounters are monitored with annual creel surveys in specified fishery areas as described in Flesher and Clarke (2018). In certain fishery areas, returned harvest card data is used in conjunction with creel survey information to provide estimates. As described below in Section 3.5.1, generating final estimates with these methods require a lag time up to two years after a fishery ends to compile and correct harvest card data. Therefore, preliminary estimates of encounters using creel survey information will be completed in the interim to guide fishery management decisions until final estimates are completed. ODFW relies on funding from the Bonneville Power Administration (BPA), through the Lower Snake River Compensation Plan (LSRCP), to staff and conduct steelhead fishery creel surveys in the Grande Ronde and Imnaha River Basins.

Monitoring the rates of encounters and mortality combines estimates generated from creel surveys with total estimates of natural steelhead returning to the Grande Ronde and Imnaha MPGs. Mortality is estimated by applying an incidental mortality rate of 5% as described above in Section 1.4, and consistent with determinations from NMFS and NOAA (1999 and 2000) as the best available estimate for natural steelhead for selective fisheries. Total natural steelhead returns to each MPG will be estimated through the Snake River Basin Steelhead Run Reconstruction model, which apportions steelhead to each Snake River Basin MPG based on Genetic Stock Index (GSI) sampling of natural (unclipped) adult steelhead at Lower Granite Dam (Stark et al. 2018). For preliminary estimates, the average proportion of natural steelhead from the Grande Ronde and Imnaha MPGs will be applied to estimated total returns to Ice Harbor Dam to estimate MPG-level abundance (see Section 1.4).

Fall Chinook encounters in mainstem Snake River steelhead fisheries are monitored with a creel survey implemented by Idaho Fish and Game (IDFG). This creel survey incorporates roving surveys (via jet boat in Idaho/Oregon joint waters in the navigable section of the Snake River), and using an angler check station located on the Idaho side of Hells Canyon Dam. Oregon anglers are required to travel through the check station to access fishing on the Oregon side of the river. Results and data summaries from these creel surveys are regularly shared with ODFW in the aforementioned coordination forums.

3.2 Description of other monitoring and evaluation not included in the Performance Indicators (Section 3.1) which provides additional information useful for fisheries management.

PIT tag monitoring: PIT (Passive Integrated Transponder) tag monitoring occurs annually as anadromous fish migrate through the Columbia and Snake River systems, where they are detected at passage routes through mainstem dams and with antenna arrays placed in tributaries. PIT tag monitoring is used to estimate abundance and monitor run timing, which allows for in season modifications to fisheries.

Dam counts and sampling: Annual counts of anadromous fish at mainstem Columbia and Snake River dams provides estimates of abundance as fish migrate through the system. Sampling at the dams provides opportunities for PIT-tagging, genetic sampling, and collection of biological data that informs additional monitoring efforts.

Life history monitoring: Juvenile anadromous fish emigrating from FMEP streams are enumerated and PIT-tagged at smolt traps to estimate abundance, evaluate migration timing, and monitor survival through the Columbia and Snake River systems (i.e., Sedell et al. 2018). These efforts also evaluate smolt to adult survival that is informative when assessing status and developing management plans.

Monitoring coordination: Anadromous fish management in the Snake River Basin is a highly coordinated process involving a large group of co-managers (see Sections 1.5 and 3.5.1). Through these efforts, co-managers develop, conduct, and share results of monitoring projects.

3.3 Public Outreach

Oregon Sport Fishing Regulations provide information on fisheries timing and location, bag limits and tackle restrictions; in addition to other pertinent information such as species identification and proper fish release techniques (ODFW 2018). Information regarding in-season regulation changes and other fishery related issues is communicated to the public via press releases, on ODFW’s website at (www.myodfw.com), weekly recreation reports released by ODFW, social media updates, creel surveyor contacts, and signage posted at access points within the fishery area. Oregon State Police (OSP) and creel surveyors also contact the public during the angling seasons each year, providing both public education and enforcement presence.

3.4 Enforcement

Oregon State Police (OSP) routinely enforces steelhead fisheries in Oregon through roving patrols. Main objectives of enforcement patrols are ensuring compliance with angling regulations, gauging compliance rates, and informing anglers. In addition, OSP conducts targeted enforcement actions when non-compliance is suspected. ODFW coordinates enforcement priorities, as determined on biological concerns for listed and/or sensitive species, with OSP on an annual basis through the Coordinated Enforcement Program (CEP). In addition, creel surveyors communicate any enforcement issues and potential violations with OSP that result from contacting anglers during surveys. Illegal harvest of natural steelhead remain at very low levels, but if this changes ODFW and OSP will ensure protection of listed stocks through additional enforcement actions, modification of regulations, and increased public outreach.

3.5 Schedule and process for reviewing and modifying fisheries management.

3.5.1 Description of the process and schedule that will be used on a regular basis (e.g. annually) to evaluate the fisheries, and revise management assumptions and targets if necessary.

Evaluation of steelhead fisheries in the Snake River Basin is coordinated in a co-management forum including NOAA Fisheries, Tribal co-managers, and states of Idaho and Washington fishery managers, and occurs in three phases:

<u>*Pre-season (prior to September 1st)*</u>: Prior to opening the annual fisheries, Snake River steelhead fishery managers develop coordinated preseason forecasts of natural adult steelhead to Ice Harbor Dam. Using information generated from the Snake River steelhead run reconstruction project, preseason forecasts are parsed into MPG-level forecasts and compared with low abundance thresholds (Critical Abundance Thresholds) specified above in Section 1.3.1. If MPG abundances at Ice Harbor Dam do not reach their aggregated critical abundance threshold (CAT), fishery managers will work with NOAA to determine what management measures will be implemented to reduce encounters of wild steelhead. The degree of management change will depend on how many consecutive years of low abundance have been observed/and or are forecasted.

<u>*In-season (September 1st to April 30th)*</u>: During the in-season period fishery managers monitor adult steelhead returns and fishery performance, with regular coordination. Fisheries are managed not to exceed collective impact rates described above in section 1.4.1. Mainstem abundance is monitored in real time via visual counts, genetic stock index sampling, and Passive Integrated Transponder (PIT) tags at mainstem dams. In addition, instream PIT tag antennas and tributary weirs are used to monitor abundance within tributaries. ODFW monitors catch rates, hatchery harvest, and natural encounters with statistical creel surveys described below in section 3.1 (Flesher and Clarke 2018). Snake River basin co-managers meet on a weekly basis via teleconference to share information and to coordinate fishery management changes as needed.

Post-season (May 1st to September 1st two years after fishery closes): Fishery managers compile, analyze, and summarize data collected during the steelhead run and fishery. Completing the run reconstruction modeling and final fishery estimates requires the return of genetic samples, coded wire tags, and angler punch cards for multiple generations of steelhead. Therefore, a lag time of up to two years can occur between the close of a steelhead fishery and the generation of final estimates.

Using data collected from annual creel surveys, ODFW will provide preliminary estimates of natural steelhead encounters (and subsequent incidental mortality) by December 31st after the steelhead season closes. These preliminary estimates are used to assess fishery performance indicators and allowable impact rates during the interim until final run construction and fishery estimates are available. Final estimates, when available, will replace preliminary estimates used to track performance indicators specified in sections 1.1.1 and 3.1.

3.5.2 Description of the process and schedule that will occur every X years to evaluate whether the FMEP is accomplishing the stated objectives. The conditions under which revisions to the FMEP will be made and how the revisions will likely be accomplished should be included.

ODFW proposes to evaluate whether the FMEP is accomplishing the stated objectives at a five-year review schedule. Recommendations from recovery plans, harvest management plans, hatchery production and management plans, biological opinions, or other appropriate mechanisms may necessitate revisions to the FMEP.

SECTION 4. CONSISTENCY OF FMEP WITH PLANS AND CONDITIONS SET WITHIN ANY FEDERAL COURT PROCEEDINGS

Fisheries outlined in this plan are ongoing and consistent with applicable *United States vs. Oregon* court decisions and related agreements.

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