

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

**Species or Hatchery
Program:**

**Round Butte Hatchery Summer Steelhead
Program**

Hatchery Stock:

**Deschutes River Summer Steelhead
ODFW Stock STS 066**

Agency/Operator:

Oregon Department of Fish & Wildlife

Watershed & Region:

**Deschutes River Watershed
High Desert Region**

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September 8, 2020

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Round Butte Hatchery (RBH) summer steelhead (*Oncorhynchus mykiss*), Deschutes River, ODFW stock 066.

1.2) Species and population (or stock) under propagation, and ESA status.

Wild summer steelhead (*Oncorhynchus mykiss*) of the Deschutes River are part of the Middle Columbia River Distinct Population Segment (DPS) that was listed as a Threatened population under the federal Endangered Species Act (ESA) on March 25, 1999 (NMFS 1996c) with a publication of the 4(d) rule in the Federal Register July 10, 2000 (NMFS 2000). Later in 2006 the hatchery-produced steelhead (stock-66) were considered listed under the federal ESA.

1.3) Responsible organization and individuals.

Lead Contact: Scott Patterson
Agency or Tribe: Oregon Department of Fish and Wildlife
Address: 4034 Fairview Industrial Drive SE, Salem, OR 97302
Telephone: 503-947-6212
Fax: 503-947-6202
Email: Scott.D.Patterson@State.or.us

On-site Lead Contact: Rod French
Agency or Tribe: Oregon Department of Fish and Wildlife
Address: 3701 W 13th Street, The Dalles, OR 97058
Telephone: (541)-296-4628
FAX: (541) 298-4993
Email: Rod.A.French@state.or.us

Hatchery Contact: Shaun Montgomery
Agency or Tribe: Oregon Department of Fish and Wildlife
Address: 6825 S.W. Belmont Lane, Madras, OR 97741
Telephone: (541) 325-5327
FAX: (541) 325-5369
Email: Shaun.montgomery@state.or.us

Other agencies, Tribes, cooperators, or organizations involved, including contractors, and the extent of involvement in the program:

ODFW is responsible for operation of the facility, and due to the hatchery location and funding responsibility, Portland General Electric (PGE) personnel are also involved in the maintenance and, occasionally, in the operation of the hatchery and associated upstream fish trap at the Pelton Regulating Dam.

The Deschutes River at the hatchery site is considered “waters bordering the Warm Springs Indian Reservation”. Under the treaty of 1855, the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS) maintain the right to harvest fish from the Deschutes River (CTWS and USA 1855). ODFW works closely with the CTWS Branch of the Natural Resources (CTWS-BNR) regarding operation of the Pelton Trap, the hatchery trap for RBH.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

- Funding for this program is approximately 90 % from PGE and 10% from BPA. BPA funds support the aspects of the Hood River spring Chinook program at Round Butte Hatchery.
- RBH has a staff of five permanent full-time employees, 1 six-month seasonal employee, and up to 11 seasonal fin clippers.
- The annual budget does not discriminate between the two species that are produced at this facility. However, approximately 48% of the fish (by weight) reared at the hatchery are spring Chinook, 39% summer steelhead smolts for mitigation releases, and 13% post-smolt steelhead for the Lake Simtustus put-and-take fishery and for the eggs being collected and transferred for the Reintroduction effort. The annual program budget from 2004- 2008 is shown in Table 1.4.1.

Table 1.4.1. Annual program budget for Round Butte Hatchery, 2004 – 2008.

Fiscal Year	Total Budget	PGE Portion of		Mitigation StS		Supplementation		PGE ChS		BPA ChS	
		Per Cent	Amount	Weight (lbs)	% of Ttl Budget	Weight (lbs)	% of Ttl Budget	Weight (lbs)	% of Ttl Budget	Weight (lbs)	% of Ttl Budget
2008	\$745,659	79%	\$586,949	42,015	42%	21,817	22%	28,462	29%	6,859	7%
2007	\$700,309	80%	\$564,709	41,861	40%	16,486	16%	34,531	33%	11,111	11%
2006	\$617,278	78%	\$482,821	45,959	42%	16,735	15%	35,123	32%	12,120	11%
2005	\$545,908	77%	\$419,468	43,440	44%	11,970	12%	34,480	35%	8,640	9%
2004	\$527,330	78%	\$408,879	42,840	43%	13,625	13%	33,517	34%	9,627	10%

1.5) Location(s) of hatchery and associated facilities.

Adult salmonids are captured in the Pelton Trap, located on the east bank of the lower Deschutes River at river mile 100.1 immediately downstream from the Pelton Regulating Dam (WRIA number 17070306.065) at an elevation of 1,390 ft above mean sea level (44° 43' 34" N and 121° 14' 45" W). The Pelton Trap is a Buckley-type fish trap with a modified hopper and is used to lift fish to ground level where a detachable chute is used to transfer them to an anesthetic tank. Adult salmonids collected for broodstock are transferred from the Pelton Trap to a truck, and transported approximately 15 miles to the holding ponds at RBH, located on the powerhouse deck immediately below Round Butte Dam (WRIA number 17070306.081). The regional mark processing code for Round Butte Hatchery is 5F33424 H24 21. This facility sits 1,591ft above MSL (44° 36' 12" N and 121° 16' 36" W). Round Butte Dam is the uppermost of the three-dam complex and impounds the Deschutes River at RM 111 forming Lake Billy Chinook. This reservoir also impounds the lower Metolius and Crooked rivers. Located downstream of Round Butte Dam is Pelton Dam at RM 103 which impounds Lake Simtustus. Post-smolt steelhead for the legal trout program in Lake Simtustus are trucked from RBH in early summer and released at the boat ramp at Pelton Park (elevation 1,508 ft above MSL; 44° 41' 06" N and 121° 14' 10" W) and Simtustus Shores (Willow Creek Arm).

Wizard Falls hatchery is located on the Metolius River, near Camp Sherman, OR. This facility is located at (44° 31' 24" N and 121° 37' 56.14" W). Eggs collected at RBH will be transferred to Wizard Falls and all steelhead for reintroduction purposed will be reared at this facility.

There will be three acclimation facilities used to acclimate steelhead to individual water sources prior to their release. One acclimation facility will be on Whychus Creek in the Camp Polk area (44° 19' 27.82" N and 120° 30' 15.23" W), which will use pumped water into a large above ground tank to help imprint fish and return back to these areas to spawn. The other acclimation facility will be located on Ochoco Creek, approximately 0.13 miles upstream from where it enters the Crooked River (44° 14' 24" N and 120° 53' 25.09" W). Ochoco Creek is a mixture of both Ochoco Creek and Crooked River water since it is used as a return flow for numerous irrigation ditches upstream. The third acclimation facility will be on the Crooked River, approximately three miles upstream from where the Crooked enters Lake Billy Chinook at the Opal Springs mitigation hatchery (acclimation site's latitude 44° 29' 21.92" N and longitude 121° 17' 55.83" W). This facility obtains its water from both Opal Springs and the Crooked River, the water mixture between Opal Springs and the Crooked River depends on the time of the year.

1.6) Type of program.

For most of its operational existence, RBH has been managed as an ISOLATED HARVEST program. Under this broad programmatic definition, two programmatic subsets can be identified:

- 1) Anadromous- "to maintain the supply of fish to the fishery that would otherwise have been lost because of habitat degradation or blocked access to natural spawning areas" (IMST 2001). RBH was constructed in 1974 after initial efforts at fish passage around the Pelton-Round Butte Hydroelectric Project failed. This program was initiated as mitigation for spring Chinook and summer steelhead runs that previously spawned upstream of the Pelton/Round Butte Project (Ratliff and Schulz 1999).
- 2) Resident- This program is to provide fish to augment the trout sport fishery in Lake Simtustus, the reservoir behind Pelton Dam. Harvest augmentation is done "to increase sport and/or commercial harvest opportunities by releasing artificially propagated salmon smolts" (IMST 2001). For this program, two ponds of post-smolt yearling steelhead are released each spring and early summer at the Pelton Store Boat Ramp and at Simtustus Shores to provide an ecologically and biologically sound fish for sport angler harvest.

RBH is also being utilized as an ISOLATED RECOVERY program. Restoring passage above the Pelton/Round Butte Project has been recommended by the Pelton Round Butte Fish Committee (FC) advising fisheries matters to the responsible entities in obtaining a new Federal Energy Regulatory Commission license to operate the project. The FC is represented by USFWS, USFS, BLM, NOAA, DEQ, the Tribes, ODFW and PGE. Following Northwest Power and Conservation Council (formerly the Northwest Power Planning Council) goals of doubling anadromous fish runs in the Columbia Basin, fish passage at Pelton-Round Butte Project is considered advantageous. The anadromous fish reintroduction program began in 2007 with the release of summer steelhead fry into waters above Round Butte Dam. Studies on the success and reestablishment of a summer steelhead are currently ongoing. The first year of returning adult summer steelhead of known origin fish from above the project was in 2012. It is not possible to speculate any effects of this action on listed steelhead in the subbasin at this time.

The reintroduction program may be divided into two subsets:

- 1) Off Site - "to reestablish salmon or steelhead populations in habitat from which they were extirpated" (IMST 2001). RBH will be used in the effort to reintroduce spring Chinook, summer steelhead and sockeye into streams above the Pelton/Round Butte Project. This role will be greatly expanded for all three of these species when the "Interim Phase" of the Fish Passage Plan (Ratliff et al. 2001) is initiated.
- 2) On Site- "The use of streamside incubators to restore native salmon and trout stock to historic levels of abundance" (IMST 2001). Related to number 1 above, due to disease concerns, one method that may be employed for all three species is placing eyed eggs in streamside incubators or hatch-boxes. This reduces the transmission of disease pathogens associated with the adults and allows for the culling of eggs from

adults with certain viral diseases. During experimental introductions of spring Chinook and sockeye salmon to the upper Metolius basin in 1999 and 2001, streamside incubators were utilized and volunteers were employed under the guidance of the ODFW Salmon Trout Enhancement Program (STEP).

Beginning in 2008, both summer steelhead and spring Chinook disease-free fry were outplanted into portions of their historic habitat for reintroduction purposes above the Pelton Round Butte Hydroelectric project. The release schedule was developed as part of the reintroduction plan calls for 325,000 to 430,000 spring Chinook fry and between 574,000-994,000 summer steelhead fry to be released on an annual basis during Phase 1 of the reintroduction program. All brood for the reintroduction program is collected at the Pelton Trap. Starting in 2010, approximately 13,000 eggs were collected from broodstock captured at Pelton trap for transfer to Wizard Falls for smolt production in support of reintroduction and increased to 50,000 eggs in 2015. In 2020, fry releases were discontinued and smolt releases increased to 100,000 for both Spring Chinook and summer steelhead. Approximately 120,000 summer steelhead eggs will be collected and transferred to Wizard Falls Hatchery to be reared for reintroduction efforts.

Once the reintroduction program discontinues fry releases and smolt releases are increased in 2020, the program will undergo another evaluation to determine the success of these management changes. We anticipate that this program could continue to expand in future years (ODFW and CTWS 2008) if success with these adaptive management changes are evident. At this time the Co-Managers would consult with the Licensees and the Fish Committee to determine what steps to take towards future management endeavors.

1.7) Goals of the program.

Three goals have been identified for the RBH summer steelhead program:

*1) Produce 162,000 smolts annually to **MITIGATE** for production and habitat losses caused by the Pelton-Round Butte Project.*

*2) Produce post-smolt steelhead yearlings for release into Lake Simtustus as catchable trout to **MITIGATE** for production and habitat losses caused by the Pelton-Round Butte Project.*

3) Collect and transfer up to 120,000 eyed summer steelhead eggs to Wizard Falls Hatchery to produce 100,000 smolts for the Reintroduction Program. Smolts will be acclimated in Crooked River and Whychus Creek, respectively, prior to release in the Deschutes basin, above the hydropower projects. This will occur until the reintroduction program goals have been attained and enough reintroduction adults return to spawn naturally to meet reintroduction goals. The over-arching goal of reintroduction is to restore self-sustaining and harvestable populations of native summer steelhead, Chinook salmon, and sockeye salmon in the Deschutes River and its tributaries upstream from

PRB, and to reconnect native resident fish populations that are currently fragmented by PRB. (ODFW and CTWS 2008).

1.8) Justification for the program.

*Goal 1. The first goal of the RBH program is to produce and release 162,000 steelhead smolts from the RBH annually to **mitigate** for production and habitat losses caused by the Pelton-Round Butte Project. The program will strive to conserve wild fish while providing public benefits through the responsible use of hatchery fish.*

When the Pelton-Round Butte Project was constructed in the 1950s and 1960s, it included fish passage facilities (Gunsolus and Eicher 1962; Ratliff and Schulz 1999). However, after the construction of Round Butte Dam and the filling of resulting reservoir, Lake Billy Chinook in 1964, successful downstream migration of juvenile anadromous fish was foiled by the hypo-limnologic outlet of the large reservoir (Korn et al. 1967). Fish passage was abandoned in 1968, and the primary mitigation measure changed from passage to hatchery production (FPC 1972). As mitigation for lost fish habitat and salmon and steelhead production resulting from the Pelton-Round Butte Project, the Federal Energy Regulatory Commission (FERC), by the terms and conditions of the hydropower license, mandated that both summer steelhead and spring Chinook smolts be reared and released from RBH into the Deschutes River below the Pelton Regulating Dam.

The summer steelhead portion of the ISOLATED HARVEST program at RBH is described below.

The current FERC operating license for the Pelton-Round Butte Project mandates that PGE shall mitigate for steelhead production lost due to hydroelectric project by funding hatchery operations to release 162,000 steelhead smolts each year. To facilitate identifying RBH-origin steelhead, release groups have been distinctively marked with a combination of multiple fin marks since the first release of 1973 brood juveniles in 1974 (Gauvin and Palmer 2010).

Several program features and hatchery operational guidelines are in place to minimize adverse effects on listed fish. First, only full term smolts are released from RBH. This rearing strategy is made possible through favorable water temperatures for proper growth rates and proper feeding regimes. Juveniles are sampled periodically to identify the onset and degree of smoltification, and release dates are timed to release juveniles that are fully smolted.

The available evidence suggests that this strategy produces smolts that migrate quickly through the lower Deschutes. Schroeder and Smith (1989) cited in Olson et al. (1989) that between 5% and 10% of steelhead release groups in 1973 and 1974 did not migrate and apparently residualized in the Deschutes. A series of reports (Newton and Nelson 1996, 1997, 1998, 1999, 2000) discussed Peterson mark recapture population estimates of redband trout abundance in four sections of the lower Deschutes from river mile 31.0 to

86.9. During these six years, over 10,700 individual redband trout from a wide variety of size classes were captured by electrofishing and examined for fin mark. No fish with RBH marks were captured, strongly suggesting that current rearing and release strategies have eliminated the tendency for hatchery origin summer steelhead juveniles to residualize in the Deschutes. In 2016, PGE determined that the median travel time from release at Pelton Dam to the mouth of the Deschutes for radio-tagged hatchery steelhead trout was slightly more than 4 days (Gonzalo Mendez, PGE, personal communication).

Second, juveniles are raised for the entire hatchery residence period on Deschutes River water and should be fully imprinted on the hatchery location and have a tendency to return there as upstream migrating adults. While the location of the hatchery makes it necessary to truck juvenile steelhead off-station and around Lake Simtustus and the Pelton Regulating Reservoir, the water source has not changed and their homing ability should not be impaired. Several observations support this thought. Adult steelhead capture at the Warm Springs National Fish Hatchery (WSNFH), a US Fish and Wildlife Service spring Chinook hatchery located at river mile 9.0 of the Warm Springs River, support this theory. WSNFH has a barrier dam and fish capture facility that makes it possible to capture and handle every upstream migrating steelhead. Less than six hatchery-origin adult steelhead captured at the WSNFH trap from run year 1982 through run year 2002 were marked with a maxillary mark, indicating that RBH is not the source of hatchery steelhead captured at that facility (Hand and Olson, 2003). With the exception of the three years when RBH steelhead were fin-marked with other marks, all release groups since 1987 have had some combination of fin-mark including a maxillary mark. This observation suggests that once RBH origin steelhead enter the Deschutes, they do not stray into the Warm Springs River, a major steelhead spawning tributary, at a high rate. The number of RBH-origin steelhead spawning in other tributaries or the mainstem Deschutes is unknown. The proportion of RBH-origin steelhead spawning in other tributaries, such as Bakeoven and Buckhollow Creeks, were generally about 1% (Wilson et al. 2016).

ODFW has operated an upstream migrant adult fish trap at Powerdale Dam (river mile 4.0) in the Hood River as a component of the Bonneville Power Administration funded Hood River Production Project (HRPP). The Hood River enters the Columbia from the south shore at river mile 170. The HRPP is primarily a supplementation project working to increase steelhead and spring Chinook runs in the Hood River and the project has a large and comprehensive monitoring and evaluation component (HDR 2008). The fish trap facility is associated with the fish ladder at Powerdale Dam where any upstream migrating adult using the fish ladder is captured. Since trap operation was started in 1991, over 12,500 hatchery-origin steelhead (as identified by fin mark) have been captured. Based on fin mark, size and time of capture, a total of three out of 12,500 steelhead could have potentially been returned from RBH releases (ODFW unpublished data). The relative numbers and the possible consequences of RBH hatchery adult steelhead potentially spawning in the wild are also discussed below in Section 2.2.2c.

Goal 2. The second goal of the RBH summer steelhead program is to produce post-smolt steelhead yearlings for release into Lake Simtustus as catchable trout to support the sport fishery in this reservoir.

A considerable amount of research has been done relative to *Ceratomyxa shasta*, a myxosporean parasite that was first detected in the lower Deschutes River immediately below the Pelton Regulating Dam in 1965 (Pribyl et al. 1997). *C. shasta* was subsequently found throughout the lower Deschutes River, Lake Billy Chinook and Lake Simtustus (Ratliff 1981, Conrad and Decew 1967). *C. shasta* causes ceratomyxosis, a progressive and often lethal infection of intestinal tissue. One result of these investigations was the discovery that fish killed by ceratomyxosis resulted in an increase in the number of infective spores in the environment (Ratliff 1993). This was found to be especially true if fish killed by ceratomyxosis were in a reservoir upstream from flowing water.

In response to these findings, only releases of Deschutes stock, ceratomyxosis-resistant rainbow trout were released in Lake Simtustus to provide a sport fishery. From 1987 through 1996, legal-sized brown trout were also released into Lake Simtustus with the goal of providing a sport fishery and to provide a biological control for abundant non-game fishes.

However, individuals from both of these groups survived turbine passage at Pelton Dam and the Regulation Dam and took up residence in the lower Deschutes River where they potentially could have competed or interbred with wild resident rainbow and now-listed Deschutes River wild steelhead juveniles. Indeed, brown trout have been captured at the Pelton Trap after these fish were released into Lake Simtustus (ODFW unpublished data) and during rainbow trout electrofishing surveys as far downstream as Cove Creek (river mile 72) (Newton and Nelson 1997).

Because of concerns about this program (ODFW 1997), the current program was initiated to rear an extra pond of Deschutes River stock steelhead and release them after the normal smolt migration period into Lake Simtustus as catchable-size "trout". All fish released under this program are given a specific fin-mark that includes the adipose fin, making them legal to retain as adult steelhead in Oregon. The yearling steelhead used for the program are resistant to ceratomyxosis, reducing the concern for increasing number of infective releases entering the river from the reservoir environment. Yearling steelhead used in Lake Simtustus are caught at a remarkably high rate by sport fishers in the reservoir and provide an acceptable alternative to the earlier harvest augmentation programs (Kern et al. 1999).

If yearling steelhead used in this way do survive passage through the project turbines, they are likely to emigrate from the lower Deschutes as smolts and subsequently return to the Deschutes River as fin-marked adult steelhead and enter the Pelton Trap if not caught in the recreational or tribal fisheries downstream. Indeed, a very small number of adult steelhead from these marked groups has been captured as returning adults at the Pelton Trap (ODFW unpublished data).

Goal 3. Collect and transfer up to 120,000 eyed summer steelhead eggs to Wizard Falls Hatchery to produce 100,000 smolts for the Reintroduction Program. Smolts will be acclimated in Crooked River and Whychus Creek, respectively, prior to release in the

Deschutes basin, above the hydropower projects. This will occur until the reintroduction program goals have been attained and enough reintroduction adults return to spawn naturally to meet reintroduction goals. The over-arching goal of reintroduction is to restore self-sustaining and harvestable populations of native summer steelhead, Chinook salmon, and sockeye salmon in the Deschutes River and its tributaries upstream from PRB, and to reconnect native resident fish populations that are currently fragmented by PRB. (ODFW and CTWS 2008).

The main purpose of this goal is to extend the range of anadromous fish in the Deschutes subbasin to historical habitats above Round Butte Dam following reestablishment of successful passage around the Pelton-Round Butte Project. These reintroductions may help recover steelhead populations in the Deschutes River subbasin. Reintroduction efforts began in 2007 with 274,000 steelhead fry released above the PRB project. Between 2008 and 2019, fry releases were between 500,000 to 900,000 fry annually. Smolts releases, originating from eggs collected at spawning at RBH but raised at other hatcheries, began in 2010 with 10,000 fish and has progressed to 50,000 in 2019. Originally it was anticipated that fry releases would remain in this range until enough reintroduction adults returned to spawn naturally to create a self-sustaining population above the hydropower projects. When this occurred, fry releases were anticipated to be reduced. However, due to the low survival and outmigration, as well as possible negative interactions with native redband trout, of fry releases an adaptive management change occurred in 2020 and the fry program was discontinued. The reintroduction program changed to smolt based program in 2020, with increased smolt releases from 50,000 to 100,000. This may change in the future if the number of adults passed above the project increases and more spawning occurs.

1.9 & 1.10) List of program "Performance Standards" and "Performance Indicators", designated by "benefits" and "risks."

See 1.10.1 and 1.10.2 below.

1.10.1) Performance Indicators – Benefits

BENEFITS	BENEFITS	BENEFITS
Performance Standards	Performance Indicators	Monitoring and Evaluation
It will be possible to identify summer steelhead released from RBH.	All summer steelhead juveniles released from RBH will be fin marked such that they can be identified as to origin.	Fin mark summer steelhead juveniles at the appropriate time in their life history. Conduct mark efficiency checks prior to release.
Healthy, full term summer steelhead smolts are released from RBH.	Release about 162,000 full term smolts annually.	Conduct appropriate disease checks, and pre-release sampling for length-weight and other indicators of smoltification. Conduct post mark checks in time to remark if necessary.

BENEFITS Performance Standards	BENEFITS Performance Indicators	BENEFITS Monitoring and Evaluation
Summer steelhead smolts released from RBH return as adults in sufficient numbers to contribute to basin and subbasin sport and tribal harvest.	Adult returns are represented in province and, more importantly, subbasin sport and tribal harvest.	Conduct harvest sampling of sport and tribal fisheries in a manner that makes comparison to past data meaningful.
Summer steelhead smolts released from RBH return to that facility in sufficient numbers to meet FERC-mandated mitigation requirements.	Adult returns to the Pelton Trap at levels to produce 162,000 smolts on an annual basis.	Operate the Pelton Trap to capture adult summer steelhead returns.
Summer steelhead smolts released from RBH return to that facility in sufficient numbers to meet in-hatchery broodstock needs.	Collect ~1,000 adult summer steelhead at the Pelton Trap and transport to RBH for holding to maturity.	Operate the Pelton Trap to collect and enumerated RBH returns. Compare returns to past years and rearing/release strategies.
RBH and wild Deschutes origin adult returns will be utilized to initiate reintroduction program.	Collect sufficient eggs to transfer to another hatchery facility to meet reintroduction smolt production needs (currently 100,000 smolts).	Operate the Pelton Trap; differentiate adult returns by fin mark and genetic testing.

1.10.2) Performance Indicators - Risks

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
Adult summer steelhead returning to the Deschutes from RBH releases do not stray into other river systems.	Out of subbasin stray rates (as evidenced by fin mark or genetic analysis) of RBH steelhead into other systems.	Monitor steelhead fin marks and genetic composition in Hood River and other locations, as available.
Adult hatchery summer steelhead s will not comprise more than 10% of the spawners in the natural areas of the Deschutes.	In subbasin stray rates (as evidenced by fin mark or genetic analysis) of RBH steelhead into Warm Springs	Monitor steelhead fin marks and genetic composition WSNFH trap and during spawning ground counts in Deschutes tributaries.

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
	River, Deschutes tribs or the mainstem Deschutes.	
Hatchery operations comply with water quality standards.	RBH meets the requirements of its NPDES permit and other permitting, as appropriate.	Environmental monitoring of appropriate water quality parameters conducted sufficient to meet reporting requirements.
Harvest of RBH summer steelhead adults minimizes impacts to listed species.	Numbers of non-target or wild salmonids caught in tribal and non-tribal fisheries and assumed hook mortality rates.	ODFW conduct harvest monitoring of sport and tribal fisheries. Appropriate enforcement to minimize illegal take.
Releases of summer steelhead smolts from RBH minimize interactions with wild fish by swiftly emigrating from the Deschutes.	Only full term, migration ready smolts will be released. Smolts will be fully acclimated to Deschutes water.	Appropriate downstream monitoring of RBH juvenile migration will be periodically conducted.
Minimize disease risk to wild fish from hatchery operation.	RBH operation conforms to all ODFW and other applicable fish health and operational guidelines.	Appropriate juvenile fish health monitoring will be conducted by ODFW pathologists. Wild juveniles will be periodically sampled to monitor disease load.
Life history characteristics of RBH summer steelhead do not diverge greatly from the wild population.	To the maximum extent possible, do not alter life history characteristic, between the wild and hatchery components.	Develop a program to periodically sample hatchery juveniles for phenotypic and genotypic characteristics in a manner that makes it possible to compare them to the wild steelhead population.
Life history characteristics of RBH summer steelhead do not diverge greatly from the wild population.	To the maximum extent possible, do not alter life history characteristic, between the wild and hatchery components.	Develop a program whereby wild adults are integrated into RBH broodstock, when appropriate wild numbers are available, to increase genetic diversity of hatchery stock.
Broodstock collection will maintain the run timing of the wild population.	Run timing of the hatchery population does not differ significantly through time from the wild population.	Compare run timing of the two groups at the Sherars Trap, at harvest census locations and at the Pelton Trap.
Reintroduction program will not adversely impact native populations above the Project.	Follow the parameters outlined in the Reintroduction Plan, do not exceed habitat capacity.	Monitor fish growth, distributions outmigration timing, reservoir passage and survival.

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
Reintroduction program will not adversely impact native populations above the Project.	Monitor genetic makeup of <i>O. mykiss</i> populations in tributaries above project where fry are introduced to identify potential impacts	Utilize wild Deschutes River steelhead broodstock when and if available to minimize potential genetic impacts.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

During 1990 through 2016, the total number of summer steelhead held for broodstock ranged from 234 to 1,427 adults (Table 1.11.1). Typically, large number of adults are held for broodstock and spawned because of the potential for losses of fry due to viral diseases. According to the Round Butte Hatchery Annual Operating Plan, approximately 280 steelhead, 92 (50% female) for the reintroduction program and 188 (50% female) for lower river/mitigation, are needed to meet production goals (McCroskey and Montgomery 2019). The number of fish held for broodstock increased significantly in 2007, with the initiation of the reintroduction program. The reintroduction effort used both fry and smolt for release strategies between 2007 and 2019, with between 400 to 550 (50% female) broodstock of adult summer steelhead collected to support the reintroduction effort. In 2020, the fry program was discontinued and smolt releases increased to 100,000 fish. This change in the reintroduction program significantly decreased the number of summer steelhead needed for broodstock due to the adaptive management change in the reintroduction efforts. Broodstock for the reintroduction effort will be spawned and eggs collected at Round Butte Hatchery, then transferred to Wizard Falls Hatchery to be raised for release as one-year old smolts.

Table 1.11.1. Numbers of naturally-produced and hatchery produced summer steelhead collected at the Pelton Trap for broodstock at RBH, 1990 – 2016 brood years.

Brood Year	Wild Males	Wild Females	Hatchery Males	Hatchery Females	Total
1990	35	38	277	212	562
1991	15	38	191	234	478
1992	29	39	140	161	369
1993	31	53	139	241	464
1994	30	51	54	99	234

Brood Year	Wild Males	Wild Females	Hatchery Males	Hatchery Females	Total
1995	16	6	266	262	550
1996	13	26	252	275	556
1997	21	36	258	243	558
1998	17	29	304	310	660
1999	6	12	205	217	440
2000	8	12	219	204	443
2001	0	0	166	180	346
2002	0	0	219	226	445
2003	0	0	252	254	506
2004	0	0	253	243	496
2005	0	0	259	242	501
2006	0	0	207	215	422
2007	0	0	438	473	911
2008	0	0	516	580	1096
2009	0	0	713	690	1403
2010	0	0	653	676	1329
2011	0	0	673	754	1427
2012	0	0	649	750	1399
2013	0	0	570	638	1208
2014	0	0	575	570	1145
2015	0	0	562	562	1124
2016	0	0	514	567	1081

Table 1.11.a. Initial estimates of the broodstock needs for the reintroduction of summer steelhead.

Subbasin	Potential need for broodstock (number of females)		Initiated in 2020
	Phase 1	Phase 2	Phase 3
---	20-25 wild ¹	20 - 50 wild ¹	20 – 100 wild ¹
Whychus Creek	78	26 - 162	23
Metolius	---	---	---
Crooked	37	56 - 384	23
Totals	<i>130 -150</i>	<i>86 - 550</i>	<i>46</i>

¹ Depending upon the availability these fish, the first 20 pair would go towards the reintroduction and the rest would be used in the lower river production programs.

Although exclusive reliance on RBH stock summer steelhead would be possible given that returns of these fish to the Pelton Trap have exceeded hatchery broodstock needs by an average of more than 1,500 fish per year since 1980, it is not the intent of the reintroduction program to do so.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Table 1.11.2a presents maximum expected numbers of steelhead released by life stages and locations. Actual release numbers from release year 1991 to release year 2016 are presented in Table 1.11.2b.

Table 1.11.2a. Proposed maximum annual releases of steelhead numbers by life stage.

Goal*	Life Stage	Maximum Number	Release Location
SUMMER STEELHEAD			
1	Smolt	162,000	Lower Deschutes River, RM 100
2	Post-smolts	33,000	Lake Simtustus
3*	Eggs	120,000	Transfer to other ODFW facility (currently Wizard Falls Hatchery) for smolt production in support of reintroduction.

Goal*	Life Stage	Maximum Number	Release Location
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* Although the smolt production aspect is identified in the Reintroduction Plan (ODFW & CTWS 2008), as the smolts are raised at another facility, it is not defined in Round Butte Hatchery Annual Operating Plan.

Table 1.11.2b. Summer steelhead releases into the lower Deschutes River from Round Butte Hatchery, by release year.

Released Year	Release Date(s)	Release Location	Fin Mark	Number per Pound	Release Number
1991	April 14-17	River Mile 100	ADRP	4.2	107,695
1991	April 14-17	River Mile 100	ADLP (W X W)	4.6	55,570
1992	April 4-9	River Mile 100	ADRM	4.2	108,682
1992	April 4-9	River Mile 100	ADLM (W X W)	4.3	52,890
1993	Mar 30-Apr 6	River Mile 100	ADRP	4.2	111,908
1993	Mar 30-Apr 6	River Mile 100	ADLP (W X W)	5.1	54,235
1994	April 11-17	River Mile 100	ADLM	4.2	164,961
1995	April 10-12	River Mile 100	ADRM	4.3	167,198
1996	April 11-17	River Mile 100	ADLP	4.3	159,631
1997	April 9-14	River Mile 100	ADLM	4.1	157,266
1998	April 6-9	River Mile 100	ADRM	4.3	173,162
1999	April 5-20	River Mile 100	ADRV	4.1	166,504
2000	April 10-14	River Mile 100	ADLM	3.8	162,005
2001	April 2-10	River Mile 100	ADRM	4.2	166,126
2002	April 1-2	River Mile 100	ADRV	4.7	159,622
2003	April 2-3	River Mile 100	ADLM	4.1	169,835
2004	April 5-6	River Mile 100	ADRM	3.9	167,534
2005	April 4-5	River Mile 100	ADLM	3.6	156,939
2006	April 3-6	River Mile 100	ADRM	3.8	176,135
2007	April 4-5	River Mile 100	ADLM	4.1	171,464
2008	April 1-2	River Mile 100	ADRM	4.1	173,788
2009	April 1-2	River Mile 100	ADLM	4.1	188,018
2010	Mar 30-Apr 1	River Mile 100	ADRM	4.3	179,171
2011	Mar 30-31	River Mile 100	ADLM	4.0	177,866
2012	April 10-11	River Mile 100	ADRM	3.9	178,151
2013	April 1-4	River Mile 100	ADLM	4.0	170,849
2014	April 1-4	River Mile 100	ADRM	3.9	179,176
2015	April 1-4	River Mile 100	ADLM	3.9	178,908
2016	Mar 30-Apr 1	River Mile 100	ADRM	3.9	178,251

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

It is possible to calculate an index of smolt to adult survival (defined as adult returns to the mouth of the Deschutes) by estimating sport and tribal harvest downstream from Sherars Falls, summing harvest with estimated escapement upstream from Sherars Falls and dividing by brood year released. The individual components of this procedure are described below.

Sport and tribal harvest downstream from Sherars Falls are estimated by conducting statistically expandable harvest census at several key locations from the mouth upstream to Sherars Falls. These samples are conducted from July 1 to October 31, a time period that is believed by managers to account for a large percentage of steelhead harvest in that Area. The physical layout of the Deschutes from the mouth upstream to Sherars Falls is such that it is possible to account for a large proportion of the harvest in that area by sampling catch at three sites – the west bank at the river mouth, the head of the Macks Canyon Road and at Sherars Falls (both tribal fishers and sport anglers). Harvested fish are identified by fin mark, making it possible to identify and separately estimate harvest of RBH origin fish as well as stray hatchery origin fish. The sum of estimated, expanded catch at these three locations for the time period sampled is thought to represent a fairly complete index of steelhead catch.

Steelhead population passing Sherars Falls is estimated for each run-year using modified Peterson Mark and Recapture Method. Steelhead are captured when they ascend a fish ladder around Sherars Falls by means of a modified Denil fishway. All captured steelhead are biosampled and tagged with an individually numbered external tag and released to continue their journey. Second-event captures to complete the data collection to make the population estimate possible are conducted at the Pelton Trap and at the WSNFH Trap. Separate modified Peterson estimates are calculated each run-year for each returning brood year of RBH origin steelhead (as identified by fin mark) as well as for wild, stray hatchery and total hatchery steelhead. The resulting population estimates represent the estimated number of steelhead, by group, that escape upstream from Sherars Falls.

Managers are aware that there is hatchery steelhead harvest upstream from Sherars Falls but have found it difficult to quantify. Angling takes place in a large and diverse area without the benefit of clear geographic control points that exist downstream from Sherars Falls making expandable harvest census challenging. Steelhead harvest by group could be estimated from this area from Oregon's hatchery harvest card reporting system. This system has an 80% non-return bias and the accuracy of these estimates is likely negatively influenced by this non-return bias. Additionally, it is not possible to determine the origin of harvested fish through the harvest card reporting system estimates. This could be overcome by applying some assumptions about the number of various fin marks in the larger population based on observations at the Sherars Falls trap and the Pelton Trap but these estimates would also be a source of potential error.

Given these difficulties in accurately estimating harvest above Sherars Falls, managers believe the most accurate way to measure the success of the RBH steelhead program is to calculate an index of smolt to adult survival by summing estimated harvest downstream

from Sherars Falls with the estimated number of passage upstream from Sherars Falls. Utilizing this methodology, an index of brood year smolt to adult survival has varied from 0.20% to 7.74% and has averaged 2.43% from the 1987 to the 2006 brood year, the last year complete data are available (Table 1.12a). See Attachment 2.

Estimated escapement of RBH origin steelhead by run year over Sherars Falls from 2003 to 2016 ranged from 412 to 9802, with an average of 4649 fish. (Seals 2016)(Table 1.16.1ab, see Attachment 5).

RBH does not have specific smolt to adult return goals other than the mitigation requirement to produce 162,000 smolts on an annual basis and the reintroduction goals to collect eggs for the production of 100,000 smolts at another facility. This requires that at least 280 adult steelhead return to the Pelton Trap to produce those target numbers. This return has been met most recent years.

An additional measure of the RBH steelhead program performance is provided by the number of RBH steelhead returning to the Pelton Trap. Steelhead captured in traps are identified as to origin by fin mark. Capture of RBH origin steelhead at the Pelton Trap ranged from 190 to 6,811 and averaged 2,484 for a period of 46 years (Table 1.12c, See Attachment 4). The original mitigation level agreed to a return of 1,800 adult steelhead to the Pelton Trap annually (FERC 1972). These data are available through the ODFW The Dalles District Office in monthly, annual or special reports.

1.13) Date program started (years in operation), or is expected to start.

The PGE-funded mitigation program for the Deschutes steelhead actually started in 1967 with the decision to terminate fish passage at the Pelton Round Butte Hydroelectric Project (Ratliff and Schulz 1999). Smolts were reared at existing state hatcheries until the 1973 steelhead brood when RBH was completed. The RBH program has been in operation for over 35 years. The reintroduction program began in 2007, with fry releases of summer steelhead above the Pelton Round Butte Project, while egg collection for smolt production at other facilities in support of the reintroduction program began in 2009, with the first outplanting of smolts in 2010. It was anticipated that stocking would occur for two or more generations or until the Phase 1 targets were met for one of the three anadromous species. The program was then to evolve into Phase 2 where outplanting would supplement natural production. The transition from Phase 1 to Phase 2 which occurred in 2011, is described in more detail below and in greater detail in Section 1.11.1). Due to low survival and outmigration, as well as possible negative interactions with native redband trout, of fry releases an adaptive management change occurred in 2020 and the fry program was discontinued. The reintroduction program changed to smolt based program in 2020, with increased smolt releases from 50,000 to 100,000. This may change in the future if the number of adults passed above the project increases and more spawning occurs.

1.14) Expected duration of program.

RBH will maintain the mitigation program into the foreseeable future and the program will be re-evaluated approximately 10 years after the first returns of adult summer steelhead that were naturally produced from areas upstream of the dams and every 5 years thereafter. Mitigation program for production at the hatchery may be phased down in correlation with the success of runs established upstream but ultimately mitigation for lost habitat and production from Project operation will have to be met for the life of the FERC license.

Success in re-establishing runs of summer steelhead and spring Chinook salmon above PRB will depend substantially on the degree to which the new SWW and fish collection facility enables the smolts of these species to migrate effectively from the mouths of tributary streams and past Lake Billy Chinook (LBC) during their journey seaward. Adaptive fish management and improvements to altered streams above LBC will both be important, but fish passage through the reservoir that is at least reasonably effective will be a necessary prerequisite to any success in establishing runs that can sustain themselves. With this in mind, reintroductions of these fish were to pass through two phases. Phase 1 was to emphasize introductions of pathogen-screened juveniles of these species above PRB, to test the ability of the new SWW facility to change surface currents in LBC and collect outmigrant smolts. It was anticipated that stocking would occur for two or more generations or until the Phase 1 targets (Table 1.14.1) were met for one of the two anadromous species. Actions taken during Phase 1 were also to (1) begin to test recent estimates of fish production potential in habitat above PRB, (2) examine fish stock performance in the available habitat, (3) continue rehabilitating altered habitats, and (4) produce modest returns of adult fish. Prior to moving to Phase 2 of the Reintroduction plan, certain measures of success had to be achieved. These measures of success include changes in reservoir surface currents, effective migration patterns of radio-tagged smolts (a biological response to the currents), and passage efficacy of about 50 percent for one or more species from one or more arms of the reservoir. The program was then to evolve into Phase 2 where outplanting supplements natural production and known-origin adult fish were passed upstream of the project.

Table 1.14.1. Measures of success for the evaluation of fish passage at PRB. (Source: 119 FERC ¶ 62,006 (2007)).

<i>Criteria And Goals For Safe, Timely And Effective Downstream And Upstream Passage</i>	
<i>Item</i>	<i>Criteria and Goals</i>
1. Screen Hydraulic Criteria	NOAA Fisheries smolt criteria
2. Downstream Passage Facility Survival (from Round Butte collection to lower Deschutes River release point)	93 percent smolt survival during first five years of operations. 96 percent smolt survival after the first five years of operation.

<i>Criteria And Goals For Safe, Timely And Effective Downstream And Upstream Passage</i>	
<i>Item</i>	<i>Criteria and Goals</i>
3. Upstream Passage Facility Survival (from lower Deschutes River collection point through Adult Release Facility)	95 percent during first five years of operations. 98 percent after the first five years of operations.
4. Round Butte Reservoir Downstream Passage during first five years of Operation of Passage Facilities	>50 percent of a statistically significant sample of tagged steelhead or spring Chinook outmigrants from any Project tributary ¹ .
5. Round Butte Reservoir Downstream Passage after first five years of Operation of Passage Facilities	>75 percent survival of PIT-tagged smolts calculated as a rolling 4-year average beginning after the first five years of Selective Water Withdrawal facility (SWW) operation ¹ .

¹ The 50 and 75 percent efficacy thresholds apply to tests of statistically significant samples of tagged steelhead or spring Chinook outmigrants from any tributary to LBC.

Consistent with adaptive management provisions included in the Settlement Agreement the decision to make the transition to upstream adult passage of known-origin fish – Phase 2 - was to be made based on numerous indicators and mitigating factors, and on sound biological principles. Smolt passage through LBC and into the fish collection facility met one agreed-upon measure of success in 2010, so the decision was made by the Pelton/Round Butte Fish Committee (see Section 1.16.1 – Fish Passage at the Pelton/Round Butte Hydro Complex) in 2011 to pass adults returning to the upper basin (i.e., after rearing as juveniles above Round Butte Dam) upstream and continued releases of pathogen-screened juveniles from the fittest lineages available into the upper basin, i.e., Phase 2 of the Reintroduction Program. These lineages may include RBH 66 stock, returning adults from above the PRB project, and wild steelhead depending on their population abundance. The exact timing and/or duration of shifts toward more or less intense releases of juvenile fish during this second phase of the reintroduction effort may well differ among species or subbasins.

The following is a more detailed description of the Reintroduction Phases as outlined in the Reintroduction Plan (ODFW & Confederated Tribes of the Warm Springs Reservation of Oregon 2008):

Reintroduction Phase 1. During Phase 1 of the reintroduction effort for a given species, the numbers of fish released into specific upper basin streams will be based on

interactions between statistical needs of fish passage studies, and realistic assumptions about the opportunity to trap smolts after they have been produced in habitats above the reservoir. In the major subbasins (Upper Deschutes, Metolius, and/or Crooked) where it is reasonable to expect that adequate numbers of naturally-reared smolts could be produced, trapped, and marked prior to entering LBC, fry releases will meet or exceed those estimated to be needed to produce the required numbers of marked naturally produced smolts for reservoir passage tests. Where fry releases into a particular major subbasin appear unlikely to provide enough naturally produced smolts to meet the statistical demands of fish passage tests, releases will be less intense but sufficient to begin testing habitat suitability, begin getting a sense of fish performance, and (potentially) to produce small numbers of returning adults.

During Phase I there will also be direct releases into the upper basin of tagged hatchery-produced smolts that have been pathogen-screened. These fish will be given a unique fin clip and tag so that it can be distinguished from those given naturally reared smolts, and released in numbers that will be large enough to meet the statistical demands of reservoir passage tests for smolts leaving each of the three major subbasins tributary to LBC. Releases of hatchery smolts for reservoir passage tests will either provide information supplemental to that obtained from tests of naturally reared smolts or enable statistically meaningful passage tests where they would otherwise be infeasible. Summer steelhead smolts will be released into the Crooked and Deschutes River subbasins, but not into the Metolius River subbasin because it is considered to have very little production potential for the species.

Each naturally-reared smolt that successfully negotiates LBC and leaves the upper basin via the SWW facility during Phase 1 will either be given a PIT-tag and left without any additional external marks or will be marked with unique fin clips. The PIT-tags will allow additional data collection on fish as they migrate to and from the ocean. The tag or unique fin clips will allow managers to assure that the fish will (1) avoid directed harvest and therefore experience lower harvest rates as they pass through fisheries when returning as adults, and (2) be identified as having upper basin origins when some of them arrive as adults at the Pelton Trap. Naturally reared returnees arriving at the trap will be passed upstream during Phase 2.

Reintroduction Phase 2. When the effort to improve smolt passage through Lake Billy Chinook and into the SWW fish collection facility shows the necessary signs of success, the reintroduction program will transition into Phase 2. In this phase adult fish returning to the Pelton Trap after having reared as juveniles above PRB will be passed into the upper basin, including those fish that reared in the upper basin during Phase 1, unless the goals of this Reintroduction Plan will be better served if a small fraction of the returnees are used as broodstock. For each species, brood-lines during Phase 2 will use wild fish where possible. However, it should be noted that fish availability may be influenced by stock status below PRB at the time of transition, and possibly by whatever efforts have been undertaken to develop summer steelhead brood-lines specifically for the reintroduction program. Brood-lines for use in the reintroduction effort might be developed at Round Butte Fish Hatchery using wild fish from the lower basin, as a way

to expand the demographic boost that could be given to developing upper basin runs early in Phase 2.

Fish releases above Round Butte Dam during this phase of the program will be intended to develop locally adapted populations, with the numbers of young fish released into specific upper basin areas reflecting information acquired on the developing anadromous runs. As an early approximation, releases of fry during the first fish generation of Phase 2 for a given species' reintroduction will be of magnitudes estimated to be sufficient by themselves to produce about 50 percent of the maximum smolt carrying capacity of a particular stream unless the number of returning adults and the anticipated progeny exceeds expectations, in which case the percentage of fry released will be reduced. This first cycle of fry releases during Phase 2 will also be supplemented with releases of hatchery smolts (which will leave the system quickly and not be significant competitors until they return as adults). Fry releases after the first fish generation of this phase will diminish as rapidly as can be justified, to avoid a situation in which an extended hatchery supplementation program works against natural selection processes.

During Phase 2 of the reintroduction effort, fish releases into the upper basin will be consistent with what is known at the time about the suitability and productive capability of available habitat. If habitat in a particular area proves to be more capable than initially predicted, fish releases there might be adjusted upwards, depending on broodstock availability. If habitat proves less capable, greater emphasis will be placed in the near term on habitat rehabilitation efforts and fish releases may be adjusted downward until habitat improves.

Marking of smolts at the SWW facility will continue until disease or other concerns have been addressed sufficiently to allow all adult fish arriving unmarked at the Pelton Trap (those wild fish that are either returning to the upper basin or migrating toward areas other than the spawning locations of their parents) to be passed upstream.

Reintroduction Phase 3. In 2020, a major change occurred to the reintroduction program in which fry stocking was discontinued and smolt releases will increase from 50,000 to 100,000 smolts for both spring Chinook and summer steelhead. Smolts will be acclimated prior to release in each individual basin of the respective species release area. Reintroduction smolts will have a left maxillary, as concurrent with Phase 1 and 2 release strategies, so that returning upper basin adults can be passed above the project. As these changes are instituted, data will be gathered and release numbers will be changed accordingly to meet the overarching goal of the reintroduction.

1.14) Watersheds targeted by program.

The lower 100 miles of the Deschutes River (WRIA number 17070305.081) is the watershed targeted by the mitigation program. There are at least 250 stream miles of potential anadromous fish habitat within the reintroduction area, plus the highly productive 4,000-acre aquatic environment of LBC, and additional habitat in Suttle Lake as well as Lake Simtustus. Habitat conditions vary considerably among the streams that will become accessible to anadromous fish reintroduced above Round Butte Dam (Riehle 2000). Potentially accessible streams in the Upper Deschutes River Subbasin (the

mainstem Deschutes River, Whychus Creek, and a few small tributaries) provide at least 36 miles of habitat, much of it in fair to good physical condition but also affected to varying degrees by water withdrawals. The Metolius River subbasin contains approximately 108 miles of potential anadromous fish streams, most very cold and undisturbed. Anadromous fish habitat in the lower Crooked River subbasin became more accessible to adult anadromous fish when the passage impediment at Opal Springs Hydroelectric Project (FERC Project No. 5891, “Opal Springs”, a half-mile above the reservoir) was remedied and totals 105 stream miles. Much of the habitat in the Crooked River subbasin is affected by streamflow depletion, but there may be options for ameliorating this situation in the mainstem Crooked River subbasin with larger seasonal releases of stored water from Bowman Dam.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1) BRIEF OVERVIEW OF KEY ISSUES

Hatchery – Wild Interactions

The number of RBH origin summer steelhead on natural spawning grounds is unknown at this time. However, an estimate of the number or percentage of RBH steelhead unaccounted for after passing Sherars Falls is possible. These estimates are made by subtracting known capture (trap captures) or estimated capture (sport harvest) of RBH origin steelhead from the population estimated to have passed Sherars Falls.

Several assumptions are required for these estimates to be completed. First, the number of hatchery summer steelhead harvested upstream from Sherars Falls is estimated through Oregon’s hatchery harvest card reporting system. As mentioned above, this system has an 80% non-return bias and the accuracy of these estimates are likely poor. For purposes of this exercise, however, these estimates are taken at face value since no way to account for this bias is known. Second, these hatchery harvest card catch estimates are only available prior to calendar year 2000. Estimates of catch after that year shown here were made from the long-term average proportion of total catch estimated to have taken place above Sherars Falls. Third, proportion of RBH origin summer steelhead in the above Sherars Falls catch is not identified through the hatchery harvest card reporting system. The estimated catch of RBH origin summer steelhead is calculated from the percentage of those fin marks in the Sherars Falls trap summer steelhead capture for that year. The Sherars Falls trap is thought to be an unbiased capture technique.

The estimated number of RBH origin steelhead remaining at large in the spawning population upstream from Sherars Falls (excluding the Warm Springs River system upstream from WSNFH) ranges from 771 to 7,271 individuals and averages 2,201 for the last 13 years of record (Table 1.16.1a, See Attachment 5). Presented another way, on the average, 49.97% of all RBH origin fin marked steelhead estimated to have passed Sherars Falls remain unaccounted for after harvest or trap capture at either RBH or WSNFH.

The final destination for these “missing” RBH origin fish is unknown. A few hatchery origin summer steelhead (as evidenced by missing adipose fin) are counted each year

during tributary redd counts but these observations are considerably less than the “missing” number (Table 1.16.1b, see Attachment 6). Further, limited redd counts in the mainstem Deschutes suggest that even if only “missing” RBH steelhead spawned there, redd counts and an assumed 2.3 adults per redd average calculation leaves significant numbers of RBH fish unaccounted for. The true fate of these fish remains the subject of speculation. The effect of this number of unaccounted RBH steelhead on the wild population is unknown at this time although the potential for deleterious genetic effects may be low since the RBH stock originated from the wild stock.

Stray or non-RBH origin hatchery steelhead have become more numerous in the Deschutes River since 1982. The mechanisms that contribute to this behavior are poorly understood. Likely causes could include smolt transportation in the Columbia River, failure of other programs to acclimate smolts prior to release, using non-native hatchery stocks in upper basin hatchery programs and returning adults from other systems using the Deschutes as a thermal refuge during the summer. While the causes of increased straying may be poorly understood, the magnitude of hatchery straying in the Deschutes River has been well documented. The number of non-Deschutes origin hatchery steelhead estimated to pass Sherars Falls each year has increased through time (Table 1.12c see Attachment 4).

Stray hatchery steelhead (as identified by fin mark) are observed in large numbers each year at the Pelton Trap and at the WSNFH trap. Very large numbers of stray hatchery steelhead estimated to pass Sherars Falls each year are not accounted for by harvest and trap catch, however due to change in water temperature management through the SWW stray hatchery steelhead numbers have significantly decreased. (Table 1.12c, see Attachment 4; and Table 1.16.1c; see Attachment 7).

Potential ecological and genetic impacts on the Deschutes River steelhead as a result of the stray steelhead phenomena are also poorly understood but are assumed to be serious. Chilcote (2000) calculates increased probability of extinction of Deschutes River wild steelhead with increasing numbers of stray hatchery steelhead. This single issue may pose the greatest single danger to the continued survival of Deschutes wild steelhead.

Broodstock Selection

The Round Butte Hatchery (RBH) summer steelhead program is a Federal Energy Regulatory Commission (FERC) mitigation program required for the Pelton Round Butte hydroelectric project funded by Portland General Electric (PGE) and operated by the Oregon Department of Fish and Wildlife (ODFW). The goal of the program is to produce 162,000 yearling smolts annually. Originally, the hatchery was to have an annual return of 1,800 adult summer steelhead returning to the hatchery, this goal was identified by the parties after it became apparent that downstream fish passage through the Pelton/Round Butte project had failed and upstream natural production and its benefits could not be maintained. Broodstock was originally collected in 1957 from Whychus Creek (formerly known as Squaw Creek), a tributary to the Deschutes above the dam complex. Since that time the broodstock has primarily been collected from both wild and hatchery origin fish returning to the Deschutes River.

Due to the documentation of large numbers of out of basin stray fish entering the Deschutes River, broodstock practices were changed and only known RBH origin summer steelhead are currently being used for broodstock. No wild origin fish have been incorporated into the broodstock, since the 1998 brood. This action was taken for the primary purpose of preventing the possible introduction of out of basin stray fish into the broodstock. Out of basin stray fish are known to carry exotic viral diseases not currently found in the RBH broodstock. This action has the potential affect to increase the domestication of the RBH summer steelhead broodstock. ODFW is currently proposing to collect wild adults at Pelton trap and, following genetic testing to verify origin and testing for IHN and BKD, utilize Deschutes River origin adults in the reintroduction program and for incorporation into, or substitution for, a like number of RBH broodstock (See Alternative 6, Section 1.16.2).

Fish Passage at the Pelton/Round Butte Hydro Complex

Currently, the Pelton/Round Butte hydro complex, at river-mile 100 on the Deschutes River, forms the upstream barrier to anadromous fish passage. Historically, summer steelhead utilized the Deschutes River up to Big Falls, portions of the Crooked River subbasin, and Whychus Creek upstream from the current dam site. As part of the FERC license renewal, the license applicants have proposed to reintroduce anadromous fish into their historic habitats.

The Federal Energy Regulatory Commission issued a new license for PRB on June 21, 2005, to Portland General Electric Company (“PGE”) and the Confederated Tribes of the Warm Springs Reservation of Oregon (“CTWSRO”), who are joint licensees (“Licensees”) for PRB. 111 FERC ¶ 61,450, *order on reh’g*, 117 FERC ¶ 61,112 (2006). The license, through mandatory conditions included in the license by the U.S. Fish and Wildlife Service (“USFWS”) and the National Marine Fisheries Service (“NOAA Fisheries”), requires implementation of the PRB Fish Passage Plan (PGE and CTWSRO 2004) to reinitiate fish passage through PRB.

The license incorporates the terms of a Settlement Agreement entered into by the Licensees and 20 other parties, including the Oregon Department of Fish and Wildlife (“ODFW”) and CTWSRO. The license establishes a Fish Committee, which is made up of the Licensees, ODFW, CTWSRO, NOAA Fisheries, the USFWS, and other agencies and entities. All responsibilities and tasks of the Licensees with respect to fish passage and reintroduction are described in the Fish Passage Plan included as Exhibit D to the Settlement Agreement. These responsibilities include fish passage improvements at PRB, a wide variety of Test and Verification Studies, and longer term monitoring efforts. The license includes a schedule for meeting those obligations.

The central element of the Fish Passage Plan is the SWW structure that was constructed at Round Butte Dam to improve water quality in the lower Deschutes River subbasin and to create currents in the reservoir that would help guide smolts to an associated fish screening and collection facility (PGE and CTWSRO 2004). This new facility, which will protect fish in LBC from being entrained into power-generating turbines, has the potential to become the centerpiece of a multi-faceted effort to reestablish runs of fish that have been absent from the upper basin for more than 45 years.

Recognizing the fish reintroduction opportunity provided by the SWW structure, the Oregon Fish and Wildlife Commission (“FWC”) adopted Oregon Administrative Rules in December 2003 that direct the ODFW to restore anadromous fish, including Mid-Columbia summer steelhead, into portions of their historic range upstream from PRB. Specific areas targeted for reintroduction include the Metolius River and tributaries, the Deschutes River from LBC upstream to Big Falls, Whychus Creek, and the Crooked River and tributaries upstream to Bowman and Ochoco Dams.

1.16.2) Potential alternatives to the current program.

The alternatives are ideas only and not necessarily endorsed by the managing agency.

Broodstock Selection

Alternative 1. Collect genetically verified Deschutes River origin wild fish from the Pelton Trap, and include into hatchery broodstock after gaining approval from NOAA Fisheries.

Incorporating known Deschutes origin wild steelhead into the hatchery broodstock has the potential to increase the fitness of the hatchery broodstock. This alternative was included in the 2010 HGMP but was not implemented at that time due to genetic and disease concerns related to the inability to ensure that out of basin strays were not utilized as broodstock. However, evolution of genetic testing techniques have made real-time confirmation of origin of potential broodstock possible and would reduce/eliminate these concerns.

Alternative 2. Collect wild fish from a Deschutes River spawning tributary and incorporate into the hatchery broodstock after approval from NOAA Fisheries.

Incorporating wild fish into the hatchery broodstock has the potential to increase the fitness of the hatchery broodstock. Collecting fish from a tributary spawning stream, reduces the chance of collecting an out of basin stray fish, since it is believed that many out of basin strays leave the Deschutes before spawning. While the stray rate for out of basin stray fish is reduced in the spawning tributaries, known out of basin fish have been observed on spawning surveys. Collecting wild broodstock from tributaries may increase the stray rate of Round Butte hatchery into tributaries. The risk from incorporating out of basin stray fish into the broodstock originally identified in the 2010 HGMP has been reduced/eliminated with recent advances in genetic testing.

Alternative 3. Remove hatchery adults at Sherars Falls to reduce the number of hatchery fish spawning in natural areas.

This would be unlikely to bring the percentage of hatchery fish on the spawning grounds down to the desired 10% level, but might reduce the impact to the wild population to some degree. This would involve a significantly larger expenditure of effort in manpower and equipment and would require agreement with other states, tribes and federal partners prior to implementation. Reducing the numbers of hatchery adults

passing Sherars Falls to a significant level would have an adverse effect on the sport fishery both upstream and downstream from Sherars Falls and may be poorly accepted by sport anglers and tribal fishers.

Alternative 4. Eliminate hatchery smolt releases of summer steelhead into the Deschutes to minimize the impact of hatchery fish on the wild population.

Significant numbers of out-of-subbasin hatchery adult summer steelhead would still be available to both public and tribal anglers. This would not bring the percentage of hatchery fish on the spawning grounds down to the desired 10% level, but might reduce the impact to the wild population to some degree. Eliminating the release of 36,000 pounds of hatchery smolts could positively impact the smolt survival of wild steelhead. Eliminating the program could violate the mitigation agreement between the state and PGE – smolts would not be produced, but 1,800 hatchery adults (out-of-subbasin) may still be trapped at the Pelton Trap.

Alternative 5. Continue to operate RBH lower river mitigation and upper basin reintroduction programs with current RBH stock as outlined in 2010 RBH Deschutes River Summer Steelhead HGMP.

This alternative is not completely possible to evaluate in terms of meeting program goals. However, if an insufficient number of broodstock return to the RBH to meet both the mitigation and reintroduction goals, a prioritization in regards to each program would have to be discussed.

Alternative 6. To the degree practicable, integrate Deschutes origin wild steelhead into or substitute for a like number of RBH broodstock in the RBH reintroduction and lower river mitigation programs to maximize genetic benefits while preserving the conservation status of the wild population. Utilization of wild fish would follow the strategy defined in Section 7.4.1, with use of wild fish in the reintroduction program given priority over integration or substitution for a like number into RBH broodstock.

ODFW proposes to implement this alternative to continue to meet current program goals and objectives.

1.16.3) Potential reforms and investments.

Reform/Investment 1: Utilizing newly developed genetic markers (microsatellite nuclear DNA), develop strategy necessary to collect, hold, and differentiate Deschutes River origin wild steelhead from out of basin stray steelhead in order to utilize the former in reintroduction and downriver mitigation programs.

Reform/Investment 2: Design, construct and operate trapping facilities at Sherars Falls and east side tributaries to capture and remove stray and/or RBH origin steelhead from wild spawning areas. The cost of this action is unknown but would be large.

Reform/Investment 3: Currently, RBH stock summer steelhead have been selected to be utilized for reintroduction purposes upstream of the Pelton/Round Butte complex. The RBH is able to manage the increases in fry production needed for the reintroduction program; however, capacity at the hatchery may need to be increased in the future as the program continues to expand. Space limitation in both the egg incubation trays and fry rearing tanks may need to be increased. At this time, smolt production associated with the reintroduction program is taking place at other facilities, but there may be changes – increased smolt production, utilizing a different facility, etc. - with this aspect of the program.

Reform/Investment 4: Develop a strategy or protocol whereby an in-season decision can be made as to whether to collect Deschutes origin wild steelhead at the Pelton trap for use as or incorporation into broodstock for the reintroduction effort and/or the downriver mitigation program.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

Section 7 Consultation, Biological Opinion on Artificial Propagation in the Columbia River Basin: incidental take of listed salmon and steelhead from federal and non-federal hatchery programs that collect, rear and release unlisted fish species (NMFS 1999a). The Deschutes River summer steelhead HGMP was submitted to NOAA Fisheries in 2004 which serves as take authorization for ESA-listed fish. This is an updated version of the previously submitted HGMP.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Stock Description

Wild summer steelhead juveniles use the lower Deschutes River as nursery ground for one to four years before migrating to the ocean. Lower Deschutes River origin wild summer steelhead typically return after one or two years in the Pacific Ocean (termed 1-salt or 2-salt steelhead). A total of eight life history patterns were identified on scales collected from a sample of lower Deschutes River origin wild adult summer steelhead (Olsen et al. 1991). Typical of other Columbia basin summer steelhead stocks, very few steelhead return to spawn a second time in the lower Deschutes River. Summer steelhead enter the subbasin primarily from June through October. Steelhead pass Sherars Falls from June through March with peak movement in September or early October, a typical Group A run timing. Wild females consistently out number males in a run year (ODFW

unpublished data). Information on sex ratio by age at return, and length-weight ratio of wild summer steelhead is not available.

Wild summer steelhead spawn in the lower Deschutes River, Warm Springs River system, White River, Shitike, Wapinitia, Eagle, and Nena creeks as well as in the Trout Creek system, the Bakeoven Creek system, the Buck Hollow Creek system and other small tributaries with adequate flow and no barriers to fish migration. Spawning in White River is limited to the two miles below White River Falls, an impassable barrier and is believed to not be a significant production area. Spawning opportunities in Nena Creek are also limited by a natural barrier.

The relative proportion of mainstem and tributary spawning is unknown. Based on limited spawning ground counts in the mainstem and tributaries, managers believe that mainstem spawning accounts for 30% to 60% of the natural production (ODFW 1987; ODFW unpublished data). The Warm Springs River system is believed to contribute a large portion of the tributary for spawning of wild summer steelhead in the lower Deschutes River. Tributary spawning ground counts are incomplete most years because many tributaries are not accessible during spawning time and water conditions preclude accurate counting. Calculation of total numbers of spawners using Warm Springs River tributaries is, therefore, not available. Counts of wild summer steelhead passing the barrier dam at WSNFH, located at river mile 9.0 on the Warm Springs River, have been greater than what can be accounted for by redd counts in all other tributaries, however.

The Warm Springs system is of particular value as a refuge for wild summer steelhead since all hatchery marked or suspected hatchery origin summer steelhead are not allowed to pass the barrier dam at WSNFH (WSNFH Operational Plan 2007-2011). This effectively excludes all non-Deschutes River origin summer steelhead except stray wild summer steelhead (Mary Bayer, WSNFH manager, personal communication).

Spawning in the lower Deschutes River and west-side tributaries usually begins in March and continues through June. Spawning in east side tributaries occurs from January through mid-April. Spawning in east-side tributaries may have evolved to an earlier time than west-side tributaries or the mainstem because stream flow tends to decrease earlier in the more arid east-side streams (Olsen et al. 1991).

Fecundity of wild summer steelhead, sampled in 1970 and 1971, ranged from 3,093 to 10,480 eggs per female with a mean of 5,341 eggs per female (Olsen et al. 1991). Average fecundity is 4,680 eggs per female for fish that have spent one year in the ocean (1-salt) and 5,930 eggs per female for fish that have spent two years in the ocean (2-salt).

Fry emerge in the spring or early summer depending on time of spawning and water temperature during egg incubation. Zimmerman and Reeves (1996) documented summer steelhead emergence in late May through June. Juvenile summer steelhead migrate from the tributaries in the spring at age 0 to age 3. Many of the juveniles that migrate from the tributaries continue to rear in the mainstem lower Deschutes River before smolting.

Scale patterns from wild adult steelhead indicate that smolts enter the ocean at age 1 to age 4 (Olsen et al. 1991). Specific information on time of emigration through the Columbia River is not available, but researchers believe that smolts leave the lower Deschutes River from March through June.

Information on survival rates from egg to smolt and smolt to adult is not available for wild summer steelhead in the lower Deschutes River.

(a) Identify the ESA-listed population(s) that will be directly affected by the program.

Listed summer steelhead of the Deschutes River of both wild- and hatchery-origin are likely to be directly affected by the RBH mitigation program and reintroduction program. The magnitude of these effects is unknown but a strategy would be developed to minimize impacts of collection of wild fish on that population by scaling the number of wild fish utilized in the hatchery programs by the size of the run.

(b) Identify the ESA-listed population(s) that may be incidentally affected by the program.

Bull trout, which reside in the lower Deschutes River, may also be incidentally affected by the presence of increased numbers of juvenile summer steelhead and spring Chinook (see Addendum A).

2.2.2) Status of ESA-listed salmonid population(s) affected by the program. Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds.

Carmichael (2009) conducted viability assessments that were reported in the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. The Table 1.12 b (Attachment 3) was derived from the plan that shows overall population viability ratings for the wild populations in the Deschutes River Basin, assuming the presence of Eastside and Westside populations. The Recovery Plan, however, stated “The genetics information that is presently being collected will better inform the genetics variation risk level in the future”. The completed genetic work (Hawkins et al. 2011) discounted the idea of separate Eastside and Westside Deschutes River wild steelhead populations as identified in the Recovery Plan and stated “there were no statistically significant differences between Deschutes-Westside and Deschutes-Eastside populations below the Pelton-Round Butte Dam complex. These data suggest that the previous delineation of populations into Deschutes-Westside and Deschutes-Eastside by the ICR-TRT does not reflect observed genetic relationships.”

For the purposes of this HGMP, the separate Deschutes River populations – Eastside and Westside – will be combined into a single run of wild steelhead in order to determine the minimum abundance threshold for allowable collection of wild Deschutes origin steelhead for broodstock. Applying the criteria identified in the Recovery Plan

(Carmichael and Taylor 2010) and the Interior Columbia Basin Technical Recovery Team (ICTRT 2007), the minimum abundance threshold for the total combined “very large” Deschutes River wild steelhead population is 2,250, whereas the sum of the separately identified “populations” in the Recovery Plan is 2,500. The minimum abundance threshold is defined as the population level needed to achieve a 5% or less risk of population extinction at the minimum productivity levels over the next 100 years. The more conservative abundance level of 2,500 will be proposed as a “floor” for allowable collection of wild Deschutes-origin steelhead for broodstock.

Although current genetic analysis disproves the concept of Eastside and Westside populations in the wild Deschutes River steelhead, the following discussion of factors, as outlined in the 2010 HGMP, that were thought to be limiting the populations is enlightening:

“The Deschutes River Eastside population currently meets the ICTRT recommendation for viable status. The 10-year geomean of natural fish abundance of 1,599 is well above the minimum abundance threshold of 1,000. The point estimate of productivity (1.89) puts the population into the status of very low risk; however the 90% Confidence Interval suggests well below the 25% risk level. This wide standard error results in a low risk level for the population abundance/productivity. The spatial structure/diversity rating is at moderate risk, primarily because of the influence of habitat changes on life history and phenotypic expression as well as out-of-DPS hatchery spawners.

The Deschutes River Westside steelhead population does not currently meet the ICTRT recommended viability criteria and is currently high risk status because the Abundance/Productivity is rated at high risk, and the Spatial Structure/Diversity rating is at moderate risk. The 10-year geometric mean abundance of 456 is well below the minimum threshold of 1,000 required for an intermediate size population. The abundance of 456 is slightly below the minimum 500 recommended by the ICTRT for maintained status. A substantial increase in productivity will be required to raise the abundance/productivity values to the low risk level. The genetic information that is presently being collected will better inform the genetic variation risk level in the future. A reduction in the out-of-ESU hatchery stray proportion will be needed to reduce the risk rating for the spawner composition metric.

The Deschutes’ Crooked River Population is extinct. The Deschutes River Westside Population includes those populations that would occur in Whychus Creek and the Deschutes River. Both would reside above the Pelton Round Butte Hydropower Project. As part of the Reintroduction program hatchery steelhead fry and smolts are being reintroduced into these areas.”

(a) Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

As mentioned above, progeny to parent ratios or survival data by life stage are not available for Deschutes wild summer steelhead. The modified Peterson mark-recapture population estimate data generated from operation of the Sherars Falls Trap, Pelton Trap and the hatchery trap at WSNFH is the most consistent and meaningful measure of productivity available for this stock (Table 1.12.c see Attachment 4).

Additionally, wild summer steelhead are captured at both the Pelton Trap and at WSNFH. Given the length of time steelhead have been blocked from areas upstream from the Pelton-Round Butte Project, wild summer steelhead captured at the Pelton Trap are likely overshoots from Warm Springs River, Shitike and Trout creeks, potentially out of subbasin unmarked strays steelhead or wild fish destined to spawn in the mainstem Deschutes. Wild steelhead typically make up a small portion of the total trap catch at that location (Table 1.12c see Attachment 4). Wild summer steelhead captured, tagged and subsequently released from the Pelton Trap have been captured in Trout Creek and Warm Springs River (ODFW unpublished data).

WSNFH tracks catch of both wild and hatchery origin summer steelhead at that facility. As mentioned above, hatchery origin summer steelhead, as identified by either the presence of a fin mark or a deformed dorsal, are not allowed into the spawning population upstream from that facility. Catch of wild summer steelhead at WSNFH has ranged from a low of 81 during the 1992-93 run-year to a high of 880 during the 2002-03 run-year and has averaged 369 for the 27 years of record (Table 2.2.2a, see Attachment 8) (Hand and Olson, 2003).

(b) Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Total wild steelhead spawner abundance is likely best described by the previously discussed Peterson mark-recapture population estimates for escapement over Sherars Falls (Table 1.12b see Attachment 3). Wild spawning escapement into Warm Springs River is most accurately measured by counts at the WSNFH barrier dam (Table 2.2.2a, see Attachment 8).

Limited summer steelhead spawning ground counts were conducted annually by ODFW personnel on the eastside tributaries of Buckhollow, Bakeoven creeks and in the Trout Creek system (Table 1.16.1b, see Attachment 6 and Table 2.2.2b, see Attachment 9). These data are not sufficient to establish the annual spawning abundance of wild- or hatchery-origin summer steelhead. Since 2005, the landowner has denied access to Bakeoven and Buckhollow creeks, and therefore, spawning ground surveys were not conducted.

The relative proportion of mainstem and tributary spawning is unknown. Based on limited spawning ground counts in the mainstem Deschutes, managers believe that mainstem spawning accounts for 30% to 60% of the total natural production (ODFW 1987). The amount or proportion of total steelhead spawning in the mainstem Deschutes River is difficult to measure. Lack of sufficient water clarity to accurately count redds is frequently an issue during the late winter and early spring when steelhead spawn in the subbasin. The gravel size preferred by steelhead in the mainstem Deschutes is frequently found along the margins of the stream in areas commonly overhung with stream-side vegetation making aerial redd counting difficult.

(c) Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

The number of RBH origin summer steelhead on natural spawning grounds is unknown at this time. However, an estimate of the number or percentage of RBH steelhead unaccounted for after passing Sherars Falls is possible. These estimates are made by subtracting known capture (trap captures) or estimated capture (sport harvest) of RBH origin steelhead from the population estimated to have passed Sherars Falls.

Several assumptions are required for these estimates to be completed. First, the number of hatchery summer steelhead harvested upstream from Sherars Falls is estimated through Oregon's hatchery harvest card reporting system. This system has an 80% non-return bias and the accuracy of these estimates is likely poor. For purposes of this exercise, however, these estimates are taken at face value since no way to account for this bias is known. Second, these hatchery harvest card catch estimates are only available prior to calendar year 2000. Estimates of catch after that year were made from the long term average proportion of total catch estimated to have taken place above Sherars Falls. Third, proportion of RBH origin summer steelhead in the above Sherars Falls catch is not identified through the hatchery harvest card reporting system. The estimated catch of RBH origin summer steelhead is calculated from the percentage of those fin marks in the Sherars Falls trap summer steelhead capture for that year. The Sherars Falls trap is thought to be an unbiased capture technique.

The estimated number of RBH origin steelhead remaining at large in the spawning population upstream from Sherars Falls (excluding the Warm Springs River system upstream from WSNFH) ranges from 771 to 7,271 individuals and averages 2,201 for the past 13 years of record (Table 1.16.1a see Attachment 5).

Presented another way, on the average, 49.97% of all RBH origin fin marked steelhead estimated to have passed Sherars Falls remain unaccounted for after harvest or trap capture at either RBH or WSNFH. The final destination for these "missing" RBH origin fish is unknown. A few hatchery origin summer steelhead (as evidenced by missing adipose fin) are counted each year during tributary redd counts but these observations are considerably less than the "missing" number (tables 1.16.1b and 1.16.1c). Further, limited redd counts in the mainstem Deschutes suggest that even if only "missing" RBH steelhead spawned there, redd counts and an assumed 2.3 adults per redd indicate a significant number of RBH fish remain unaccounted for. The true fate of these fish remains the subject of speculation.

The effect of this number of unaccounted RBH steelhead on the wild population is unknown at this time although the potential for deleterious genetic effects may be lower than for non-RBH stock or stray hatchery origin steelhead since the RBH stock originated from the wild stock. Additionally, proposed incorporation of limited numbers of wild Deschutes origin into RBH stock should lessen the potential for deleterious genetic effects.

Stray or non-RBH origin hatchery steelhead have become more numerous in the Deschutes River since 1982. The mechanisms that contribute to this behavior are poorly understood. Likely causes could include smolt transportation in the Columbia River, failure of other programs to acclimate smolts prior to release, using non-native hatchery stocks in upper basin hatchery programs and returning adults from other systems using the Deschutes as a thermal refuge during the summer. While the causes of increased straying may be poorly understood, the magnitude of hatchery straying in the Deschutes River has been well documented. The number of non-Deschutes origin hatchery steelhead estimated to pass Sherars Falls each year has increased through time, however due to the change in water temperature management through the SWW the number of non- Deschutes origin hatchery steelhead has decreased over time. (Table 1.12b, see Attachment 74).

Stray hatchery steelhead (as identified by fin mark) are observed in large numbers each year at the Pelton Trap and at the WSNFH trap. Very large numbers of stray hatchery steelhead estimated to pass Sherars Falls each year are not accounted for by harvest and trap catch, however (Table 2.2.2c; see Attachment 7).

Potential ecological and genetic effects to Deschutes River steelhead as a result of the stray steelhead phenomena are also poorly understood but are assumed to be serious.

Chilcote (2000) calculated increased probability of extinction of Deschutes River wild steelhead with increasing numbers of stray hatchery steelhead. The number or percentage of RBH steelhead remaining in the system and available to spawn in the wild has not shown a pattern of increase during the last 12 years while non-RBH stray hatchery origin fish have shown a large increase in number (Table 1.16.1a, see Attachment 5). As mentioned above, RBH could stop release of steelhead juveniles and desired management targets for wild and hatchery interaction would still not be met due to the number of non-RBH stray hatchery origin fish. This issue may pose the greatest single danger to the continued survival of Deschutes wild steelhead.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

All steelhead entering the Pelton Trap are confined for a variable period of time. Generally, the trap is operated and all fish are removed three times per week and during winter months when trap catch is low, the facility is emptied once per week. Lethal take is minimized by promptly returning wild steelhead and bull trout to the Deschutes River via a 10” watered PVC pipe.

Direct take of listed hatchery-produced STS adults held in broodstock ponds has been very small through time (Table 2.2.3a, Attachment 11). From the historic perspective, holding mortality did take place on years when wild steelhead were collected for broodstock and held to maturity at RBH (Table 2.2.3a, see Attachment 11) so it is anticipated that some mortality of wild fish may occur if they are held for integration into RBH programs.

Direct take of listed hatchery-produced STS shall occur at spawning when fish are sacrificed to collect samples in order to determine disease (IHN and BKD) status of brood. Wild fish utilized in RBH programs will be live spawned, if possible, to minimize this source of take, but ovarian and milt samples will still need to be collected for determination of IHN status of broodstock.

Currently no monitoring, evaluation or other research programs associated with steelhead are conducted at RBH. Population monitoring of adult steelhead, including listed wild steelhead, is conducted by ODFW at Sherars Falls. Samples of steelhead ascending the fish ladder at Sherars Falls are taken and tagged from June through October each year. This information will be used, as described in Attachment 19, to estimate the total run size of wild Deschutes origin steelhead in order to determine if and at what level broodstock can be collected at the Pelton trap for use in reintroduction and integration. Second event capture of tagged and untagged steelhead takes place upstream at WSNFH and at the Pelton Trap. Separate Peterson mark-recapture population estimates are made for each segment of the summer steelhead run. This activity is subject to take permitting through the federal 4(d) process.

(a) Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Operation of Pelton Trap between June and December every year is likely to result in the delay, capture, and handling of returning adult Mid-Columbia summer steelhead and bull trout. Handling of these fish may cause injury through descaling in addition to those impacts listed above. The risk to listed steelhead is low from hatchery activities and the likelihood of mortality from these activities is very low. Listed hatchery-produced adult STS are currently being taken for broodstock purposes; limited numbers of listed wild adult STS are proposed to be collected, held, live spawned, if possible, and following protocols determined by ODFW pathologists, returned to the river in order to integrate wild fish genetics into RBH programs (See Section 7.4.1. and Attachment 19 for proposed protocols).

(b) Provide information regarding past takes associated with the hatchery program (if known) including numbers take, observed injury or mortality levels for listed fish.

As outlined above, there is not currently a direct take of wild summer steelhead for broodstock, although it has occurred in the past and ODFW is proposing at the present time that a limited number of wild adults be collected for integration into RBH programs. Presently proposed direct take of wild adults would be limited by 1) identification of Deschutes origin wild fish through genetic testing, 2) isolation and holding of wild fish in separate brood holding ponds (effectively reducing holding densities), 3) and live spawning, if possible, wild fish utilized as brood.

With the exception of past wild steelhead collections for broodstock, direct take (mortality) of listed fish through hatchery collection operations has been very small through time. Although records on observed injury rates have never been kept at the Pelton Trap, handling mortality at that facility is virtually nonexistent. From the historic perspective, holding mortality did take place on years when wild steelhead were collected for broodstock and held to maturity at RBH (Table 2.2.3a, see Attachment 11) so this take may occur if wild fish are held for integration into RBH programs but should be reduced by the measures outlined in the paragraph above.

(c) Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

No direct take of listed wild STS is currently taking place. Presently, unintentional mortality of listed wild steelhead is limited to that which occurs at the Pelton Trap where listed wild fish are captured, tagged, handled and released back to the Deschutes River. Wild Deschutes summer steelhead have been identified as the priority stock to be used in the Reintroduction effort once criteria for the SWW and Fish Passage system (Table 1.14.1) had been met. Now that the criteria have been attained, we propose to initiate the use of wild steelhead as broodstock. Unless extraordinary circumstances or new information dictate a change, broodstock collection would not occur unless predicted wild steelhead run size exceeded 2,500 adults (based on conservative estimate of minimum abundance threshold of the entire Deschutes River population); collection would occur up to 4% of the predicted run size (see Attachment 19 for further description of protocol). As described in Table 1.11.1a, approximately 100 wild summer steelhead (50 females) would be utilized in the manner described in Section 7.4.1 as future broodstock to seed the habitats above PRB and for integration into or substitution for RBH broodstock. Assuming use of limited numbers of natural-origin adults for broodstock is approved, Tables 2.2.3b and 2.2.3c (Attachment 12) provides a projected annual take for natural- and hatchery-origin summer steelhead adults, respectively, the only life stage handled by the RBH program.

The projected annual take of listed bull trout has been provided in Addendum A (Table 1).

(d) Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

No intentional take occurred in the recent past and past program operation suggests that the potential for incidental take is very low. Pelton Trap operation has been refined through time to prevent handling mortality and redundant systems are in place to provide for emergencies. Several factors act in concert to keep even a worst case take scenario to a small number of wild steelhead. First, wild steelhead are not captured in large numbers at the Pelton Trap either at one time or in total. Generally, less than 10 wild individuals are captured at any one time. The trap is typically emptied three times per week, shortening the time fish are exposed to any trap induced injury. Second, no wild

steelhead broodstock are collected at the present time so other than handling and limited bio-interrogation, wild fish are not trucked or subject to additional handling.

Wild steelhead are not currently passed upstream of the Pelton-Round Butte Project, but may someday be used as part of a restoration program. Utilization of adult wild steelhead is identified as the priority stock for use in support of reintroduction. It is thought due to genetic fitness, that the progeny of wild steelhead have the greatest opportunity to successfully survive and outmigrate through the upper basin watershed. With the current request to take a limited number of Deschutes origin wild fish in support of reintroduction, take levels would be limited as described in Table 1.11.1a; all efforts would be made to eliminate lethal take, including isolating wild brood from hatchery brood and live spawning, if possible, wild fish prior to return to the river.

If the proposed use of wild Deschutes origin steelhead as broodstock for the reintroduction program and for integration into or substitution of hatchery adults into the RBH mitigation program is approved, safeguards - conservative minimum population threshold, > 2,500 wild fish, for brood collection, a maximum 100 fish brood collection cap and no greater than 4% of the predicated run - have been built into the brood collection protocol that should minimize take beyond acceptable levels. If new information or unforeseen circumstance dictate, brood collection and/or associated protocol could be adjusted or curtailed as deemed prudent. Finally, if the 3-year rolling average of the percentage of the Deschutes-origin wild steelhead run collected for broodstock equals or exceeds 4%, no wild Deschutes origin steelhead will be collected until that average falls below 4%.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Alignment of the hatchery program with any ESU-wide hatchery plan.

The Conservation and Recovery Plan for Oregon Steelhead Populations in the Mid-Columbia Steelhead Distinct Population Segment (Carmichael and Taylor 2010) to the degree possible as current genetic work demonstrates that the delineation of the wild Deschutes River steelhead run into Eastside and Westside populations was erroneous. Key elements of the plan include identifying the current population status, which, again, proved incorrect, major limiting factors and threats, management actions to address all threats, and an implementation plan and a monitoring program to assess success and make adaptive changes. The plan will help guide the actions of state, federal, and tribal agencies, as well as watershed councils, local governments, non-governmental organizations and landowners.

3.2) Existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

- 1) ODFW Lower Deschutes River Management Plan (Pribyl et al. 1997)
- 2) Reintroduction and Conservation Plan for Anadromous Fish in the Upper Deschutes River Sub-basin, Oregon Edition 1: Spring Chinook Salmon and Summer Steelhead (ODFW & CTWSRO 2008) is intended to contribute to a successful reintroduction effort by identifying key management issues and how they will be resolved in an adaptive fashion. It discusses species and stocks to be reintroduced to areas above Pelton Round Butte Dam, and provides general guidance on methods, release locations, numbers, timing, and adjustments in hatchery supplementation as populations become re-established.
- 3) The Pelton Round Butte Project's Fish Passage Plan (Ratliff et al. 2001) was approved by the Federal Energy Regulatory Commission (FERC) with the issuance of the FERC license in June 2005. The Fish Passage Plan included serves as the basis for fisheries mitigation associated with the Pelton Round Butte Project (FERC # 2030).
- 4) The Licensees and ODFW entered into a long term hatchery management agreement which includes the development of an Annual Operating Plan for the Round Butte Hatchery. The AOP sets forth details of the operation of the RBH and includes a production plan and a release plan for the fish associated with mitigation and production. The AOP contains estimated egg-take and fry release number for the reintroduction program for spring Chinook and summer steelhead populations upstream of the Pelton Round Butte Project. The plan also includes production goals and estimated release dates and numbers of hatchery spring Chinook and summer steelhead smolts to be released into the lower Deschutes River (Gauvin and Palmer 2009).
- 5) Reintroduction of anadromous fish runs upstream of Round Butte Dam is also mentioned in and consistent with the Crooked River and Middle Deschutes Wild and Scenic River Plan (BLM et al. 1992) and the Metolius River Wild and Scenic River Plan (USFS et al. 1996).
- 6) 2008-2017 US. Vs. Oregon Management Agreement
- 7) Artificial Production Review (NPPC 1999).
- 8) Review of artificial production of anadromous and resident fish in the Columbia River Basin (Brannon et al. 1999).
- 9) Operation plans for anadromous fish production facilities in the Columbia River Basin (IHOT 1996).
- 10) Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle

Columbia River Steelhead Distinct Population Segment (Carmichael and Taylor 2010).

3.3) Relationship to harvest objectives.

The mitigation goals that led to the construction of RBH during the initial FERC license were based on salmon and steelhead returns to the Pelton Trap and have no explicit harvest goals (Ratliff and Schulz 1999). Implied in the goals for adult returns to the Pelton Trap was that downstream harvest of a portion of these hatchery fish would take place and mitigate for harvest opportunities lost as a result of construction of the Pelton Round Butte Project.

One objective of the ODFW Lower Deschutes Management Plan as applied to summer steelhead is: "to provide a recreational fishery based on wild summer steelhead, out of subbasin stray hatchery summer steelhead and lower Deschutes River origin hatchery summer steelhead returns."

Sport harvest of wild summer steelhead in the lower Deschutes River has been prohibited since 1978. All steelhead smolts liberated from RBH are fin-marked, and any steelhead harvested must be of hatchery origin as identified by the adipose fin clip. During 2001, the daily bag limit on hatchery steelhead in the lower Deschutes River was increased from two to three to attempt to reduce the number of hatchery steelhead spawning in the wild. Estimated harvest of RBH summer steelhead in the lower Deschutes River is presented in Table 3.3 (Attachment 13).

Harvest is the primary objective for the yearling steelhead release into Lake Simtustus. During the evaluation of this program, a harvest of 49% in 1997 and 54% in 1998 was observed in the sport fishery in Lake Simtustus (Kern et al. 1999).

The major goal of the reintroduction effort is to restore "*self-sustaining and harvestable populations of native summer steelhead, Chinook salmon, and sockeye salmon in the Deschutes River and its tributaries upstream from Pelton Round Butte, and to reconnect native resident fish populations that are currently fragmented by Pelton Round Butte.*"

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Summer steelhead angling and harvest has been historically popular and important for recreational anglers and tribal fishers. Wild summer steelhead could be retained by recreational anglers prior to 1978, under a two fish per day regulation. Natural bait and barbed hooks were legal in the bulk of the lower Deschutes River during this period. An anticipated low return of wild summer steelhead to the lower Deschutes River in 1978 resulted in closure of the lower Deschutes River to summer steelhead angling on 20 August 1978. The season reopened 1 July 1979, with a wild fish release rule that has remained in effect to date. The use of natural bait and barbed hooks was also prohibited starting in 1979 except that bait was allowed in a one-mile reach downstream from Sherars Falls. This area was expanded to a three-mile reach of river from Sherars Falls

downstream to the upstream most railroad trestle in 1990. Angling from a floating device has been illegal since 1936 in the Deschutes River. This regulation effectively lowers catch rates on adult summer steelhead and provides significant protection from angling mortality to juvenile summer steelhead.

Currently, the daily bag limit for steelhead is three adipose fin clipped hatchery summer steelhead. No weekly bag limit is in effect although a statewide annual limit of 20 fish was in force when this document was written. Hatchery steelhead are legal to retain year-around in waters of the Deschutes open to angling. Currently, that portion of the Deschutes River not bordering the Warm Springs Reservation is open to angling (and retention of hatchery origin steelhead) year-around. The portion of the Deschutes River bordering the Warm Springs Reservation (river mile 71 to river mile 100) is currently closed to all angling by non-tribal members from 1 January until the fourth Saturday in April each year. Harvest regulations for recreational fisheries in the subbasin are set by the Oregon Fish and Wildlife Commission.

Catch and harvest of summer steelhead in the lower Deschutes River have been estimated by statistical harvest estimation procedures since 1970. Statistical harvest estimates have been calculated for fisheries taking place at Sherars Falls for both recreational anglers and tribal fishers, at the start of the Macks Canyon Road (river mile 42) and at the west bank at the mouth of the Deschutes River (Heritage Landing at river mile 0). The harvest sample at Heritage Landing produces an estimate of all land based, power boat, and drift craft angler effort and catch for those anglers fishing downstream from Macks Canyon (river mile 24). The harvest sample at the start of the Macks Canyon Road produces an estimate of all angler effort and catch leaving the river via the Macks Canyon Road. The Sherars Falls harvest sample produces an estimate of effort and catch by both sport anglers and tribal fishers in the area from Sherars Falls to Buck Hollow Creek. Minor effort and catch takes place in the Kloan area (river mile 6), and on the east bank near the mouth. Past sampling has suggested that it was not cost effective to sample these locations and these data have not been gathered for many years.

All samples are standardized on a 1 July to 31 October statistically random schedule designed to estimate total effort and catch at each sample point. Catch is categorized by wild, RBH origin, and stray hatchery origin. If the three samples are completed on a given year, their sum is an estimate of total catch and effort for the period of the sample from Sherars Falls downstream to the mouth of the river. Minor catch of summer steelhead does occur after the sample period; therefore, these figures are not estimates of total catch but are valuable as indices of catch. Additionally, steelhead are harvested upstream from Sherars Falls, principally in the Maupin, South Junction, Trout Creek, and Warm Springs areas. Harvest from these areas can be estimated from catch record cards (punch card) but insufficient resources are available to complete total harvest estimates for the entire lower 100 miles of the Deschutes River.

Catch of RBH origin summer steelhead has been estimated by expanded harvest census since 1970, although not at all sites all years. Catch of RBH origin summer steelhead by recreational anglers in years when total catch below Sherars Falls was estimated ranged

from a low of 84 in 1998 to a high of 3,287 in 1974. The percentage of RBH origin steelhead in the sport catch in years when sport catch was sampled at all sites has ranged from a low of 11% in 1993 and 1998 to a high of 92% in 1974. During years of unconstrained harvest, tribal fishers harvested a low of 221 RBH origin summer steelhead in 1976 and a high of 1,925 in 1974. It has not been possible to separate RBH origin steelhead from other hatchery steelhead harvested by tribal fishers in recent years. The percentage of RBH origin adults in the fisheries has decreased over time, due largely to the increasing percentage of stray origin hatchery summer steelhead in the catch.

Stray hatchery summer steelhead have become more numerous in the catch of recreational anglers and tribal fishers since 1982. During years when recreational catch was sampled at all sites, harvest of stray hatchery summer steelhead ranged from a low of 289 in 1974 to a high of 2,661 in 1989. The percentage of stray steelhead in the sport catch in years when sport catch was sampled at all sites has ranged from a low of 8% in 1974 to a high of 89% in 1994. During years when tribal fishers had unrestricted seasons, a low of eleven stray hatchery summer steelhead were harvested in 1975 and a high of 2,407 was harvested in 1983. It has not been possible to separate stray origin steelhead from RBH origin steelhead harvested by tribal fishers in recent years.

Currently, no specific harvest management goals or harvest allocation agreements exist for hatchery produced summer steelhead in the lower Deschutes River. ODFW works closely with the CTWS to encourage harvest of hatchery origin summer steelhead while protecting wild summer steelhead in the Deschutes River sport and tribal fisheries.

3.4) Relationship to habitat protection and recovery strategies.

A major factor affecting natural production of summer steelhead in the lower Deschutes River is the quantity and quality of habitat for these species in the mainstem and particularly the tributaries. The hatchery program is not directly related to this habitat but is an outgrowth or attempt to mitigate for the loss of access to habitats for these species upstream of the Project. The major mitigation effort during the new FERC license for the Pelton-Round Butte Project is expected to be reconnected to these habitats. Additional mitigation effort will also go to habitat enhancement, especially for steelhead habitat. However, these plans are still in the formative process. Aquatic habitat upstream of Round Butte Dam is known to be suitable for use by the anadromous species historically present in the upper basin. Recent assessments combined with modeling suggest that with passage through Lake Billy Chinook it has the potential to support a very large sockeye salmon population (in the reservoir itself), sizeable populations of summer steelhead in Whychus Creek and in the lower Crooked River subbasin, and somewhat smaller runs of Chinook salmon. Uncertainty remains, however, about (1) how productive these species will prove to be in existing upper basin habitats and (2) the degree and rate at which fish passage impediments and degraded habitat conditions in some upper basin streams will be addressed.

3.5) Ecological and Genetic Interactions.

RBH releases approximately 162,000 steelhead smolts into the lower Deschutes River annually. In addition, approximately 30,000 post smolt steelhead are liberated into Lake Simtustus each spring. These fish have the potential to move downstream through the turbines at Pelton Dam and the Reregulating Dam and take up residence in the lower Deschutes River. The ecological and genetic risk posed to listed fish in the Deschutes River from these fish is thought to be considerably lower than from non-native fishes. The Reintroduction plan calls for annual releases of 574,000 to 994,000 of disease free summer steelhead fry. Additionally, although not raised at RBH, additional steelhead smolts are released into the upper basin as part of the reintroduction program. These releases were conducted in the Crooked River and Whychus Creek subbasins. Due to low survival and outmigration of fry, as well as low numbers of returning adults, the fry program was discontinued in 2020. Smolt releases increased from 50,000 to 100,000 in 2020.

The impact on resident species is unknown at this time, although recent evidence shows that releases of hatchery smolts generally migrate out of the upper system fairly rapidly. Hatchery fish may impact wild salmonids in the lower Deschutes including listed wild steelhead through competition for food and/or space, predation, disease, and changes in behavior (Brannon et al. 1999). Every effort is made to release hatchery juveniles that are fully smolted and ready to migrate to the ocean, and thus minimize the time for negative ecological interactions to take place. As discussed above, the available evidence suggests that these efforts are successful. Probably the greatest ecological and genetic risk to wild steelhead in the lower Deschutes basin comes from the presence of large numbers of out-of-basin stray hatchery steelhead, many of which spawn in the river and tributaries. This continued infusion of maladapted traits into the population is likely to have an adverse effect on the genetic health of the listed fish (Lichatowich 1998, Chilcote 2000).

However, the numbers of wild steelhead returning to the river have been surprisingly large in recent years (Attachment 4) and correlate well with favorable ocean and freshwater conditions. During favorable water years, more freshwater habitat is available for steelhead production in the lower Deschutes tributaries. Recent studies have shown good wild smolt production from Trout Creek and continue to underscore the importance of healthy tributary habitat for wild steelhead in the Deschutes subbasin (Nelson 2001). These observations of the wild population responding to favorable environmental conditions suggest that the population retains enough genetic health and resiliency to respond to the environmental variables.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Round Butte Hatchery is located on the powerhouse deck at Round Butte Dam and receives its water from the west bank grout tunnel drilled into the canyon wall immediately west of the hatchery. When the dam was being constructed during the early 1960s, tunnels were drilled into the basalt canyon walls at several elevations on each side of the dam site. Liquid grout was pumped into the tunnels and used to fill cracks in the basalt in an attempt to minimize seepage through the rock on either side of the dam. After Lake Billy Chinook filled in 1964, some delayed seepage did find its way through the cracks in the basalt and was captured in the lower tunnels that open above the powerhouse on each side. When RBH was sited, it was the presence of the delayed seepage water on the west bank that was the determining factor for siting the hatchery where they did. Although this is seepage water, it travels through enough rock that it emerges at about 52°F year around. Approximately two weeks after there is turbidity in the tailrace from run-off out of the Crooked River basin, the hatchery water becomes slightly off color. This indicates a mean seepage delay time of at least that long. Over 20 cfs of water emerges from the west-bank grout tunnel at a year round temperature of 52° F (11° C). Total dissolved gas is slightly above saturation in the tunnel. The drop through a grate in the flume immediately below the tunnel that crosses the access road is designed to eliminate this excess gas and saturate the water with dissolved oxygen. In general, external fish parasites common to salmonids do not find their way from the reservoir into the hatchery water supply, and RBH has very low parasite loads. Water quality parameters were sampled at the RBH source intake and all parameters were found to be within acceptable limits (Nyara 1989) (Table 4.1, see Attachment 16).

Wizard Falls Hatchery is located on the Metolius River near Camp Sherman, about 20 miles west of the town of Sisters. The site is at an elevation of approximately 2,760 feet above sea level at latitude 44.5233 and longitude -121.6314. The hatchery land area is 35 acres. The hatchery was constructed in 1947 and the water is currently supplied from two sets of springs. Water rights for both springs combined is 13.5 CFS. When the hatchery went into production the West Bank Spring (WBS) was only available until 1989 when East Bank Spring (EBS) became operational. The WBS provides 10 CFS of water at 50°F all year round and is located on the West side of the river about 1/8 mile upstream of the hatchery. The WBS comes out of the ground and travels approximately 200 yards before entering the intake. EBS provides 2.5 CFS of 44°F water year round and is located on the East side of the river and is about 1/2 mile upstream. The EBS comes out of the ground and immediately into a capped spring box and enters the intake. WBS water quality is good with clean oxygenated water, but does have some low level parasites. EBS water quality is excellent with clean, oxygenated and pathogen free water. Starting in 2012 and ending in 2017 the hatchery underwent three modification improvement phases. The old circular and oval ponds were decommissioned and new starter ponds and intermediate rearing ponds were built. By doing this the hatchery gained the option of reusing the

water a second time on the lower ponds. The reuse water is used to rear older age classes of fish that are more tolerant of degraded water quality.

The Whychus Creek Acclimation Facility will use a 120' long by 12' wide by 4.9' high Modutank structure with a polyurethane liner, in which water will be pumped from the creek using a 5 horsepower irrigation pump with state and federal mandated pump screens in the creek. The water will be pumped through the tank at an approximate rate of 600-800 cfs. The outflow of the pond will be in the same approximate location as the inflow so no water will be loss to the stream and will have minimal impacts. The water will be utilized through a ODFW Salmon Trout Enhancement Program (STEP) water right exemption. The acclimation facility will be operational from March through the middle of May and staff, as well as, volunteers will be on-site to inspect the facility and feed fish during the acclimation period. If power is lost on-site a backup generator will be wired to automatically power on and air stones will be placed on the bottom of the tank to increase dissolved oxygen if power is lost for a period of time.

Live cars will be used at the mouth of Ochoco Creek at RKM, 321, a tributary of the Crooked River, for interim acclimation purposes. These live cars are placed in the stream and are approximately 10 feet long, 6 feet wide and 4 feet deep. The live cars have a ¼ wire mesh around the cage and have opening in the back of the live car so that it can be pulled and the fish can be released volitionally. The live cars are placed in the water so that they are 3 quarters submerged in water. Approximately 2,000 to 2,500 smolts will be acclimated per live car for 8 to 10 days and then released. Individual release groups will be between 8,000 to 10,000 smolts, depending on water flow and depth in Ochoco Creek at the time that the smolts are put into the live cars. The landowner, the Deschutes Land Trust, plans to restore the property and plans are currently being formalized for the restoration approach, which are out for comment to respective agencies, NGO's and private parties within the basin. Until the restoration is complete, which won't possibly be until 2025, acclimation will continue to occur in live cars in Ochoco Creek or until another option is deemed more applicable.

Opal Springs hatchery, located on the Crooked River at RKM 336, is small hatchery that is owned and operated by Deschutes Valley Water District (DVWD) that raises approximately 6,000 steelhead smolts from RBH broodstock for mitigation purposes that are volitionally released into the Crooked River at the facility as part of the DVWD mitigation and in conjunction to bolster the Reintroduction efforts. Broodstock for Opal Springs mitigation program would not be supported by the proposed integration of wild broodstock and would utilize RBH broodstock that is intended for lower Deschutes mitigation releases. It is run in conjunction with the Opal Springs Hydropower facility, of which DVWD owns and operates as well. This facility runs off of both opal springs water, a natural spring that produces a significant flow into the Crooked River, and also Crooked River water depending on the time of year, water flow levels are and if mixing of the water is needed to facilitate acclimation purposes. The Opal Springs spring water coming into the facility is approximately 2.3 cfs and 0.5 cfs is Crooked River water. The water source for the facility is from Opal Springs and the Crooked River, which can be mixed depending on the source need for the application. The water that comes from Opal Springs is provided by head pressure from the spring themselves and the Crooked River

water comes from the Penstock, which is screen so that no fish can enter or exit from that source. Once DVWD releases their mitigation smolts in early February, Reintroduction smolts are then transferred into the Opal Springs facility for acclimation purposes. The facility is approximately 2,300 cubic feet, with a water depth of 30 inches.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood of for the take of listed natural fish as a result of hatchery water withdrawal, screening or effluent discharge.

Since hatchery water is not withdrawn from a live stream but rather is derived from the west bank grout tunnel drilled into the canyon wall immediately west of the hatchery, there is no possibility of effect to listed fishes from hatchery water withdrawal.

Effluent discharge meets Oregon Department of Environmental Quality standards both at the hatchery and at the Pelton Ladder spring Chinook rearing and acclimation site. Meeting these standards represent the minimums required by law and should minimize the potential take of listed species.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

All broodstock are collected in the Pelton Trap at the Reregulating Dam (RM 100.1). The trap is open year around and fish are never denied entry. The trap is checked once to three times per week, depending on the numbers of fish captured and the time of year. The fish are contained in a holding area approximately 2200 ft³ (18'X18'X7') with a through flow of approximately 3 cfs (Duke Engineering 1999). Fish are pushed toward a hopper gate by a wooden brail system. When about 20 fish are in the hopper, it is raised via a system of pulleys to the level of the working floor. A ramp placed on the hopper gate facilitates the movement of fish from the hopper into an anesthetic tank that is charged with carbon dioxide. When the fish have been anesthetized, they are classified as broodstock, river returns, or as program excess. Excess fish are either distributed to CTWS or local food share organizations if fish are still food quality or are buried if they are not.

Fish collected as broodstock at the Pelton Trap are moved to the liberation truck for a water to water transfer via the trap brail and hopper. A recent study concluded that the current operation of only the east tunnel as an entrance to the Pelton Trap poses “no significant delay or rejection of the ladder to the Pelton Fish Trap with only the east-bank entrance” (Fritsch et al. 1997).

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

The liberation truck currently used at RBH is a 1,600 gallon Model 7400, DT – 530 International. It is oxygenated with compressed oxygen and has a Lombardini recirculating pump. The truck is equipped with a hose that allows fish to be transferred from the truck without handling. There is a gauge that allows the operator to control the poundage of fish to be monitored. This truck is used for moving both adults from the Pelton Trap and smolts to the ladder rearing cells.

Additionally, a 650 gallon tank mounted in the bed of a pickup and equipped with two chambers with separate airstones attached to oxygen tanks is sometimes used to transport fish from the Pelton Trap to a separate holding pond.

5.2) Broodstock holding and spawning facilities.

Each broodstock holding pond at RBH is approximately 15'X50'X4' with approximately 900 gal/min upwelling water flow from Round Butte Dam grout tunnel seepage. The ponds are covered by a roof, but they are not enclosed in a building. Six foot tall fencing keeps predators out of the holding ponds. Spawning facilities consist of an enclosed building with a concrete floor and stainless steel or aluminum tables. The spawning building is immediately adjacent to the broodstock holding ponds for easy access to fish slated for spawning.

5.4) Incubation facilities.

The RBH incubation room measures approximately 20'X20' and contains 15 stacks of 16 Heath trays per stack. The water source is from Round Butte Dam leakage and has been found to be free of contaminants and well oxygenated (Table 4.1). Water temperature is approximately 11°C but can be chilled to 5°C or warmed to 14°C as needed to adjust timing of egg development.

The incubation room at WFH measures approximately 40'X50' and contains 18 stacks of 16 Heath trays per stack. The water source is from West and East Bank Springs and has been found to be free of contaminants and well oxygenated. Water temperature is either 44°F or 50°F and can be mixed or isolated as needed to adjust timing of egg development.

5.5) Rearing facilities.

There are 24 circular tanks that are 6 feet in diameter and 3 feet deep for rearing fry at RBH. These tanks are supplied by seepage water of nearly constant temperature (11°C) from Round Butte Dam. Dissolved oxygen content of the water is nearly 100% saturation. The tank outlet standpipes are covered with 1/16 inch mesh screens that allow water to outflow but prevent fry escape. Flow in these tanks is generally about 15 gallons per minute. Each tank is outfitted with an alarm that sounds at the hatchery office and at the Pelton-Round Butte Project operator's office when water level has fallen to about one half of normal. These tanks are housed in a metal shed constructed in 2001. Tanks are

cleaned daily and mortalities are removed at this time. Each tank has its own tools for picking and cleaning to limit cross contamination of tanks.

After summer steelhead reach approximately 300 fish/lb at RBH they are transferred to one of 10 Burrow raceways. Each raceway is mostly self-cleaning but also has its own set of picking and cleaning tools. The water level of the raceways is controlled by the height of standpipes at the outflow. The water source for the Burrows raceways is seepage from Round Butte Dam, and its temperature is fairly constant at 11°C. All ponds are pressure washed between occupations to prevent algal growth and clogging of the screens. All ponds are equipped with alarms that sound at the hatchery office and at Pelton-Round Butte Project operator's office when there is excess or insufficient water. All of the ponds are equipped with over-head sprinklers that prevent sunburn to the fish during the summer. Although each pond is outfitted with one Neilson feeder, all feeding is primarily done by hand to reduce variation in growth.

At WFH there are 16 rectangle starter tanks that are 40 feet long, 4 feet wide and 5 feet deep for rearing fry. These tanks are supplied by West Bank Spring water of nearly constant temperature (50°F). Dissolved oxygen content of the water is nearly 100% saturation. The tank effluents are covered with 1/16 inch mesh screens that allow water to outflow but prevent fry escape. Flow in these tanks is generally about 20 gallons per minute to 100 gallons per minute. Each tank is outfitted with an alarm that sounds at the hatchery office and each employee's radio when water level has fallen than normal operations. These tanks are located outside. Tanks are cleaned daily and mortalities are removed at this time. Each bank of four tanks has its own tools for picking and cleaning to limit cross contamination of tanks.

5.6) Acclimation/release facilities.

When the smolts are to be released, they are loaded onto a 1,600 gallon Model 7400, DT – 530 International liberation truck. It is oxygenated with compressed oxygen and has a Lombardini re-circulating pump. The truck is equipped with a hose that allows fish to be transferred from the truck without handling. There is a gauge that allows the operator to control the poundage of fish to be monitored. The smolts are transported to the Deschutes River below the Pelton Fish Trap where they are released into the river via a watered 10" tube with an approximate slope of 30°.

Currently, reintroduction smolts are being acclimated in Whychus Creek using a modutank system, live cars in Ochoco Creek and Opal Springs hatchery on the Crooked River. Descriptions of these acclimation applications can be found in section 4.1, on page 41 and 42. All fish that are acclimated, are then volitionally released from these locations, except a small release group, approximately 10,000 smolts, that will be acclimated at the Opal Springs Hatchery and then trucked and released at Pelton Re-Regulation dam in the lower Deschutes River.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

In the 25-year history of RBH, very few human caused disasters have occurred. Approximately 100,000 eggs were lost in 1992 when the arm on the thermograph was moved and warm water bathed the trays of spring Chinook eggs instead of the intended chilled water. In 1973, an experiment to determine if steelhead smolts could be produced in significant numbers from releases of fingerlings in Lake Billy Chinook and Lake Simtustus resulted in the loss of 300,000 fingerlings.

The major concern at RBH has been the incidence of epizootics. Soft-shell egg disease, bacterial kidney disease, ceratomyxosis and infectious hematopoietic necrosis have all plagued this hatchery since its inception.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

All alarms are wired into the Pelton-Round Butte Project operator's office which is manned continuously. Should alarm go off when no one is at the hatchery, the operator is instructed to call the hatchery person on standby. Brood ponds have been covered and enclosed with a fence to exclude predators, principally otters. The addition of a building to the spawning slab reduces the accumulation of ice and freezing of the water lines. The water that feeds the incubation trays and the rearing tanks is run through a series of sand filters before passing through an ultraviolet sterilizer.

The only place of risk for listed species is at the Pelton Trap. Water supply at this facility is by gravity flow from the Pelton Regulating Dam. Water flow through the trap is controlled by manual valves to minimize the risk of catastrophic failures.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

All summer steelhead broodstock are proposed to be captured at Pelton Trap. Original broodstock for the RBH steelhead program also were collected at the Pelton Trap. Prior to the construction of Pelton Round Butte Project, steelhead spawned in the Crooked River drainage, Whychus Creek, and the Deschutes River below Big Falls (RM 132).

6.2) Supporting information.

6.2.1) History.

Broodstock for hatchery production prior to 1957 was collected from Whychus Creek, a tributary to the Deschutes River above the dam complex. Willamette River stock and Big Creek stock winter steelhead were used for broodstock in 1958 and 1959, respectively. Skamania and Siletz stock summer steelhead were used as broodstock in 1965 and in 1965-66, respectively (Olsen et al. 1991). The Big Creek stock is known to be somewhat resistant to *C. shasta*, the myxosporean parasite found in the Deschutes River and known to cause a high rate of mortality in salmon and steelhead that are not resistant to it. The Siletz River stock is very susceptible to this organism. These fish likely did not survive and return as adults to make any genetic contribution to the naturally reproducing population. Both the Willamette River and Skamania stocks exhibit a higher degree of resistance to *C. shasta* and it is possible some adults could have survived from these releases to return to the lower Deschutes River. Potential genetic exchange from these stocks to wild summer steelhead in the subbasin is unknown. All broodstock from 1967 to present have been collected only from the lower Deschutes River.

The steelhead run-year in the Deschutes starts June 1 and extends through May 31 of the following year. The hatchery program was started using wild adult steelhead entering the Pelton Trap during the late 1960s. Beginning with the 1976-1977 run, a program was initiated to minimize run-timing changes by selecting adults from over the entire run (Ratliff and Schulz 1999). The date that adults became ripe and were spawned at the hatchery was shown to be directly correlated with the mean trap entry date for the next generation, i.e., progeny of earlier-spawning adults entered the trap earlier (Ratliff 1974). To maintain the run timing, average numbers arriving by month were calculated, and one-third of the broodstock (and eggs) were taken from fish arriving prior to December 10 (Group 1), one-third from fish arriving between December 10 and January 31 (Group 2), and one-third from adults arriving after January 31 (Group 3). In addition, all wild adults captured were transferred to the hatchery for incorporation into the broodstock. Wild adults not spawned were returned to the lower Deschutes for natural spawning (Ratliff and Schulz 1999).

No eggs were taken from Group-1 steelhead from 1987 to 1993. Group 1 production was eliminated to make pond space in the hatchery for the wild x wild production reared during those years as will be discussed below. Eggs from Group 1 were taken in brood years 1995 and will continue to be collected in the future since separate ponds are not needed for the wild x hatchery production scenario.

Both wild and RBH stock summer steelhead were collected at the Pelton Trap and held for broodstock prior to the 1984 brood year. However, two things occurred that changed the policy for including wild fish in the broodstock. In 1981, the federal Food and Drug Administration determined that “malachite green,” the chemical used as a fungicide at the time, was carcinogenic, and that food-fish treated with the chemical could not be released. Wild steelhead that were not ripe by the end of spawning in 1981 had to be destroyed. Because of this, and secondarily, the fear that some wild fish were strays and

might be carrying a strain of IHNV disease from the upper Columbia, it was decided in 1982 that wild steelhead captured in the Pelton Fish Trap would be returned to the Deschutes River to spawn naturally and not transferred to the hatchery (Ratliff and Schulz 1999).

Broodstock for the 1984 through 1987 brood years were selected only from RBH origin steelhead because of concerns about introducing foreign strains of the Infectious Hematopoietic Necrosis virus (IHNV) into the RBH steelhead program.

In 1988, concerns for maintaining genetic characteristics overcame concerns for alien viruses, and the brood selection criteria changed again (Ratliff and Schulz 1999). From 1988 through 1992, managers collected wild steelhead for broodstock at the Pelton Trap in addition to RBH origin steelhead. One-third of the production was taken from wild parents and reared separately. The other two-thirds were taken from Group 2 and Group 3 returns. Wild adults were injected with hormones to speed the rate of development to promote earlier spawning. However, this was only partially successful, and the small number of adults involved resulted in many small groups of eggs taken over an extended period which, ultimately, needed to be reared together. Much effort was directed at varying water temperatures on these eggs and fry to attempt to get them to begin feeding at approximately the same time.

As discussed above, wild broodstock used from 1988 to 1992 was incorporated into production through wild by wild pairing as opposed to a wild by hatchery pairing. Wild by wild offspring accounted for 27% to 34% of releases during those years. Wild broodstock collected in 1993, 1994, and 1995 was used in a wild by hatchery matrix pairing and resulted in wild genetic material being incorporated into the resulting egg take at a 32%, 61%, and 16% rate, respectively.

After the 1997-98 wild broodstock collection at Sherars Falls, disease concerns, specifically the potential for whirling disease from out of subbasin stray wild fish, have precluded the use of wild steelhead as broodstock at RBH. A stray hatchery-origin steelhead with presumptive evidence of whirling disease exposure was first sampled in 1987 at WSNFH (Leek, 1987). Subsequent whirling disease sampling, particularly at RBH has consistently detected presumptive evidence and/or confirmatory of exposure to whirling disease in stray hatchery-origin and unmarked steelhead. Recent sampling shows that almost 21% of stray hatchery fish sampled had detectable *M. cerebralis* spores (presumptively infected) and at least 5% were histologically confirmed as infectious (Engelking 2002b).

Using wild summer steelhead for hatchery broodstock at RBH is subject to problems and limitations. Wild summer steelhead tend to hold in the lower Deschutes River over winter and many that enter the Pelton trap do so in late February and March. These fish are not as sexually mature as the hatchery fish captured earlier in the run and held at the hatchery in water warmer than the river. This difference in time of capture and degree of sexual maturity makes it difficult to incorporate the desired number of wild fish into the broodstock. This difficulty was overcome, in part, by collecting a portion of the needed wild fish at the Sherars Falls trap in September and October and holding them in the

hatchery broodstock ponds until needed. Fish held in this manner tend to mature earlier since water temperature in the brood ponds averages more than 10 degrees warmer than the river and can be used at a higher rate for broodstock. This strategy was used from the 1994-95 to 1997-98 broods to increase the number of wild steelhead used in the broodstock at RBH.

The presence of stray hatchery-origin and presumable wild steelhead in the Deschutes River seriously complicated broodstock management at RBH. The available data were very clear on the presence of large numbers of stray, out of subbasin hatchery summer steelhead in the Deschutes.

Over 70% of all hatchery steelhead sampled at the Sherars Falls Trap in some years are not RBH origin while up to 50% of all hatchery steelhead collected at the Pelton Trap are not RBH origin (tables 1.12b and 1.12c). While the number of stray wild steelhead in the Deschutes River population remains unknown and the subject of speculation, managers are concerned if non-finmarked, wild summer steelhead were used as broodstock at RBH, there is a potential to collect a stray non-finmarked individual that has been exposed to whirling disease. *M. cerebralis*, the parasite that causes whirling disease is established in the Grande Ronde and Imnaha rivers of the Columbia River basin (Bartholomew 1999) and, as outlined above, has been detected in steelhead in the Deschutes. Managers have elected to take a conservative approach relative to wild broodstock collection. Non-RBH origin steelhead have not been collected and used for broodstock after the 1997-98 broodstock collection. With better understanding of whirling disease and how to eliminate transmission through hatchery broodstock as well as recent advances in our ability to identify the origin of unmarked summer steelhead, we feel we can safely begin to incorporate wild Deschutes origin steelhead into the RBH broodstock.

6.2.2) Annual size.

During 1990 through 2016, the total number of fish held for broodstock ranged from 234 to 1,427 adults. Typically, large numbers of adults are held for broodstock and spawned because of the potential for losses of fry to viral diseases. No wild fish have been taken as broodstock since the 1997-98 run-year. No fish with marks other than RBH fin marks are used for broodstock. Beginning with brood year 2007, broodstock was taken at a much higher level due to the initiation of the Reintroduction program (Table 6.2.2, see Attachment 14). It is anticipated that approximately 46 spawning pairs will be needed to produce the eggs for transfer to Wizard Falls hatchery for the reintroduction effort.

6.2.3) Past and proposed level of natural fish in broodstock.

The number of naturally produced summer steelhead used as broodstock in the RBH program recently has varied from a high of 140 during the 1990 brood year to a low of 16 during both the 1996 and 1998 brood years (Table 6.2.3, see Attachment 15). No naturally produced fish have been utilized as broodstock since the 1997-98 run year. During years when naturally produced summer steelhead were used as broodstock, an average of 17.5% of the fish spawned were wild.

Within the past 30 years, the number of wild steelhead captured at the Pelton trap has varied from a high of 398 during the 2009-10 run to a low of 27 during the 1994-95 run (average of 137 fish during the last 30 years). Deschutes River, wild stock, summer steelhead have been identified as the priority stock for use in the Reintroduction effort. ODFW is proposing, after approval from NOAA and consultation with CTWS_BNR, that when run size is appropriate (see Attachment 19 for protocol), to take up to 100 wild Deschutes origin wild stock (50% females) (Table 1.11.1a) for use in the upper basin reintroduction program and for integration into or substitution for RBH broodstock. Given an anticipated maximum capture of 400 wild fish at the Pelton trap (based on maximum capture of 398 in the last 30 years), up to 300 fish would be handled, tagged, and released back into the Deschutes river below the facility, while a maximum of 100 fish would be transferred to RBH to be held, live spawned, if possible, and released.

6.2.4) Genetic or ecological differences.

A comparison of 4 enzymes by electrophoresis between groups of RBH steelhead, wild Deschutes steelhead, and wild rainbow trout resulted in no significant difference amongst the samples (Chilcote 1976). Examination of relative survivability of different matings of hatchery and wild Deschutes steelhead revealed that there are behavioral differences between the two (Reisenbichler 1976). Ten protein-coding loci were used to characterize a number of steelhead populations on the west coast, including RBH and Deschutes wild, by starch gel electrophoresis (Reisenbichler et al. 1992).

Schreck et al. (1986) compared biochemical, morphological, meristic, and life history characteristics among steelhead stocks in the Columbia basin. Lower Deschutes River wild summer steelhead were found to be a component of one of the three subgroups of stocks found east of the Cascade mountains; specifically, the group formed by stocks found in the Columbia Basin from Fifteenmile Creek in Oregon to the Entiat River in Washington.

Currens (1987) examined differences between resident rainbow trout and steelhead among unisolated tributaries within the Deschutes River basin. Based on morphological and biochemical analysis, little genetic differentiation among steelhead populations in tributaries was found. Differences were found between tributary populations and those in the mainstem lower Deschutes River. This difference may have been the result of sampling adult resident rainbow trout in the mainstem lower Deschutes River and rainbow-like juvenile steelhead from the tributaries.

Minimum population abundance thresholds for Deschutes River wild steelhead identified in the Recovery Plan were based on the premise that there were distinct Eastside and Westside populations (Carmichael and Taylor 2010), although it was noted the genetic work being conducted at the time of the publication of the plan could alter that designation. Results of that work (Hawkins et al. 2011) determined that “there were no statistically significant differences between Deschutes-Westside and Deschutes-Eastside populations below the Pelton-Round Butte Dam complex. These data suggest that the previous delineation of populations into Deschutes-Westside and Deschutes-Eastside by the ICR-TRT does not reflect observed genetic relationships.”

Some life history differences are known to exist between Deschutes wild steelhead and the RBH stock. The RBH rearing regime, typical of hatchery steelhead programs throughout the region, is designed to raise steelhead juveniles to smolt size in one year. This strategy greatly simplifies the natural rearing pattern in the Deschutes wild population that was found to be 29% age 1, 55% age 2, 14% age 3 and 2% age 4 (Olson et al. 1991).

Steelhead held in the RBH brood ponds are known to spawn earlier than steelhead in the wild. This difference is likely due to the difference in temperature between the RBH holding ponds and the run-of-the river temperatures during the same period. The RBH holding ponds are supplied by constant 52 degree F water while run of the river temperatures likely fluctuate from the mid 30 degree F to the mid 40 degree F range. However, no evidence exists to suggest that RBH fish and wild fish held to maturity under the same temperature regime spawn at different times. There appears to be a difference in sex ratios between wild and RBH returning adults captured at the Pelton Trap, although it is unknown if this difference is significant.

During run years 1972 through 1989, the sex ratio of RBH steelhead averaged 1.44 females per male while wild steelhead averaged 2.02 females per male at that location and 2.22 females per male at the WSNFH trap (Olson et al. 1991).

The average median date of return of summer steelhead to the Pelton Trap during the period June 1 to May 31 for the 1972 through 1989 run years was January 3 for RBH steelhead and January 27 for wild steelhead. Timing of return to the Pelton Trap was significantly different ($p=0.057$) for wild steelhead than for RBH steelhead in years when these data were available (Olsen et al. 1991).

A large number of wild and hatchery steelhead from other Columbia Basin production areas stray into the lower Deschutes River. An unknown number of these stray steelhead leave the lower Deschutes River and continue their migration up the Columbia River. Others are harvested in fisheries in the lower Deschutes River and some remain to spawn in the subbasin. The amount of genetic interchange between stray wild and lower Deschutes River origin wild summer steelhead is unknown.

6.2.5) Reasons for choosing.

See discussion 6.2.1, above.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Broodstock are selected to represent the entire run timing without any bias for phenotypic characteristic, to maintain genetic diversity with the hatchery-produced population and also to minimize adverse ecological and genetic effects to native fishes, if interbreeding occurs.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Known RBH origin and wild Deschutes origin adults will be captured in Pelton Trap for broodstock for all programs associated with RBH.

7.2) Collection or sampling design.

As discussed above, summer steelhead collected for RBH brood stock are captured at the Pelton Trap and are collected in three groups to maintain run timing characteristics of the adults. Approximately one third of the necessary broodstock is collected during each group period October 1 to December 9, December 10 to January 31 and February 1 to March 1. Capture efficiency at this facility is unknown but is assumed to be high for RBH fish returning to this location since further migration is not possible. The long temporal period of broodstock collection and collection without regard to phenotypic characteristics should allow for a non-biased broodstock collection. If NOAA approval is given to collect wild fish for broodstock, the protocols listed in Section 7.4.1. and Attachment 19 will be followed unless unforeseen circumstances or new information suggest that it would be prudent to alter or cease collection of wild fish. Unforeseen circumstances would include if the 3-year rolling average of the percentage of the wild Deschutes origin steelhead run collected for broodstock equals or exceeds 4%. If this was to occur, no wild Deschutes origin steelhead will be collected until that average falls below 4%.

In order to maintain run timing characteristics of the later arriving adults, an additional group period may be added but collection will continue in a non-biased manner with regard to phenotypic characteristics.

7.3) Identity.

All RBH produced summer steelhead have a fin clip unique in the Columbia basin to this hatchery and are easily identified from both wild and stray hatchery steelhead. Wild Deschutes origin summer steelhead would be identified utilizing appropriate genetic testing. If produced, first generation progeny of wild parents for downriver mitigation would be identified with a unique fin clip and/or CWT combination.

The fish that are being utilized for the reintroduction effort will receive a fin clip different than those given to RBH production broodstock. Smolts that are raised in other facilities for reintroduction will receive a left maxillary clip only. Fish that are released as fry and are captured in rotary screw traps during research studies or captured at the Fish Transfer Facility (part of the Selective Water Withdrawal structure) will receive a right maxillary clip only. These fish will not have the adipose fin removed. This will help differentiate between production fish and wild origin fish capture at Pelton Trap.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

Current summer steelhead production goals can be met through collection of 280 adults to produce 162,000 smolts for Deschutes River mitigation and 30,000 post-smolts for harvest supplementation in Lake Simtustus, and 100,000 smolts for reintroduction. Program goals and adult broodstock needs for proposed reintroduction of summer steelhead upstream from the Pelton-Round Butte Project are anticipated to be approximately 92 adults (50% female).

Deschutes River, wild stock, summer steelhead have been identified as the priority stock for use in the Reintroduction effort. ODFW is proposing, after approval from NOAA and consultation with CTWS_BNR, that when run size is appropriate (following protocol outlined in Attachment 19), to take up to 100 wild Deschutes origin stock (50% females) (Table 1.11.1a) for use in the upper basin reintroduction program and for integration into or substitution for RBH broodstock. Given an anticipated maximum capture of 400 wild fish at the Pelton trap (based on maximum capture of 398 in the last 30 years), up to 300 fish would be handled, tagged, and released back into the Deschutes river below the facility, while a maximum of 100 fish would be transferred to RBH to be held, genetically tested to confirm origin as Deschutes River, live spawned, if possible, and released.

The wild natural-origin fish would be partitioned for use in the reintroduction smolt program, 1st priority, and any surplus wild fish over reintroduction broodstock needs would be integrated into RBH broodstock based on physical constraints of the hatchery where the smolts are raised. For example, under current operation, it requires ~10 females to produce eggs necessary to produce the 25,000 smolts to fully utilize a raceway. Therefore, depending on the number of wild Deschutes origin broodstock available, the first 40 (50% female) wild Deschutes natural-origin fish would be utilized for the reintroduction program. Once the reintroduction programs wild broodstock needs are met, any surplus wild Deschutes natural-origin fish would be integrated into the RBH broodstock up to the 100 wild Deschutes origin maximum allotted. At the present time, and into the foreseeable future, ODFW does not currently have hatchery capacity to utilize the full 100 wild fish requested in the reintroduction program. Until that occurs, ODFW proposes to utilize the additional wild fish beyond that capacity and up to the appropriate brood collection target (Section 2.23.c. and Attachment 19) for integration into or substitution for Round Butte Hatchery broodstock in a manner to maximize the genetic contribution or benefit of the wild fish .

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Wild and hatchery summer steelhead collected for broodstock are presented in Table 6.2.2 (Attachment 14).

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Under agreement with the CTWS all fish in excess of broodstock are provided to (CTWS Resolution No. 1935, January 20, 1961). Those in excess of the Tribe's needs are offered to local food banks or food share organizations. Fish not claimed by either organization, or carcasses from spawning, pond mortality or culls are buried on Ivan Flat near the PGE Pelton-Round Butte Project office.

7.6) Fish transportation and holding methods.

All fish captured in the Pelton Trap are anesthetized with CO₂ prior to handling. Transport of fish returned to the river is via a watered 10" tube with an approximate slope of 30°. Summer steelhead collected for broodstock are returned to a hopper that provides water-to-water transfer of broodstock from Pelton Trap to a 1,600 gallon liberation truck.

The liberation truck is equipped with redundant oxygenation systems that maintain adequate O₂ to the fish in transit. The trip from Fish Trap to the holding ponds takes approximately 30 minutes. Distribution to the holding ponds is via a gate valve and trough directly into the holding ponds. Wild fish will be held in a pond separate from known RBH stock, pending results of genetic testing. At spawning, RBH fish are crowded to one end, captured with dip nets, killed, and handed to a person who takes them to an enclosed spawning slab. Wild fish will be crowded, captured with dip nets, anesthetized, live spawned, if possible, and transferred to the liberation truck for recovery and transfer back into to the lower Deschutes river.

7.7) Describe fish health maintenance and sanitation procedures applied.

A variety of fish health diagnostic and maintenance procedures are utilized under supervision of the ODFW fish health specialist assigned to the hatchery. All fish health monitoring will be conducted by a qualified fish health specialist.

Juvenile fish are rarely treated for external parasites at RBH because of the very low incidence of external parasites in the hatchery supply water. Juvenile fish are treated for bacterial infections with oxytetracycline, Aquaquycin or florfenicol medicated food according to label, with a veterinary prescription or under an Investigational New Animal Drug (INAD) permit. Juveniles are examined at least monthly and more often as necessary. A representative sample of healthy and moribund fish from each lot of fish will be examined. The number of fish examined will be at the discretion of the fish health specialist. Appropriate actions including use of drugs or chemicals will be as recommended by fish pathologists. If bacterial infections require treatment with antibiotics, a drug sensitivity profile will be generated when possible.

Adult fish held at the hatchery are treated with formalin to control fungus and may receive an inoculation with antibiotic to control bacterial infections. Broodstock are examined to determine the presence of viral reportable pathogens. Samples are taken from 100% of all the broodstock. If fish being utilized for production needs are found to be infected with moderate to high levels of BKD or IHN, those fertilized eggs are culled from the incubation trays. Only fertilized eggs that are from 100% virus free parents will

be utilized for the reintroduction effort. American Fisheries Society “Fish Health Blue Book” procedures will be followed. Any occurrence of abnormal fish mortality will be promptly investigated. Fish health status is determined prior to release or transfer to another facility. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release. Fish culture practices are reviewed as necessary with facility personnel. Where and when pertinent, nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures, and treatments will be discussed. Findings and results of fish health monitoring will be recorded on a standard fish health reporting form and maintained in a fish health database. Between each use of trays or picking tools, the equipment is washed with a solution of Argentyne. Each pond or circular tank has its own brushes, nets, etc. to minimize cross contamination.

7.8) Disposition of carcasses.

All spawned carcasses are buried. As mentioned above, all other surplus carcasses are donated to CTWS or food banks or are buried at an onsite landfill when these interest groups indicate that they no longer wish to receive fish and/or when adults are unfit for human consumption.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

An adult recovery tank has been installed at the Pelton Trap location so that any wild fish not utilized for broodstock are returned to the Lower Deschutes River are under observation and fully recovered from prior to being returned to the river. The hatchery and wild fish will be given a series of prophylactic treatments to reduce the potential mortality on fish being held in the brood ponds.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

RBH and wild broodstock will be held in separate ponds and will be spawned as they become ripe on one of three or four spawning days. Summer steelhead selected for spawning are selected at random as they become ripe. RBH broodstock have unique fin clips so they need no further identification before spawning. Fish from the three (potentially four periods if wild fish are utilized) broodstock collection periods for are spawned together at random. Broods are randomly selected, not by size or phenotypic characteristic. Similar, methods will be utilized for any wild steelhead that may be used as broodstock in the future (see Section 7.4.1). Any, and all, steps will be taken to only spawn wild fish with wild fish for use in the Reintroduction program, while wild fish utilized for integration into or substituted for RBH broodstock production will be

spawned with RBH stock or wild fish, respectively to maximize the genetic benefit of their use.

8.2) Males.

Males are selected for spawning as described above. Repeat spawners are present in such low numbers in summer steelhead population as to be insignificant. Males are also randomly selected and not by phenotypic characteristic including size or age and both 1-salt and 2-salt males are collected as broodstock and used in production at approximate proportion to their representation in the larger population.

8.3) Fertilization.

Eggs of each female are placed in a 1-gallon bucket and fertilized with sperm from a single male. Once the eggs are fertilized, eggs from 2 females are combined in one bucket. All eggs are treated with 1:100 parts of Argentynine for 10 minutes prior to incubation. Eggs of each tray are marked according to donor parents in order to identify the batches if culling becomes necessary due to disease diagnosis.

8.4) Cryopreserved gametes.

This facility presently does not cryopreserve gametes.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Presently, no listed natural fish are used in the broodstock at RBH. By spawning only the fish that are of known RBH origin (as determined by fin mark), strays are eliminated and the threat of introducing out-of-basin genetic material into the wild through RBH steelhead is eliminated. However, the Deschutes River summer steelhead of wild stock has been identified as the priority stock for use in the Reintroduction effort. Additionally, there would be benefits to either integrating some local wild brood into the RBH broodstock or substituting first generation progeny of wild X wild crosses for RBH stock as part of the production program. These wild fish may become available depending on strength of run size and after consultation the CTWS-BNR. If Deschutes River wild summer steelhead are utilized for broodstock for the reintroduction and, in addition to, the mitigation programs, unknown origin wild steelhead will be genetically tested to ensure they are of local origin before being utilized in the reintroduction or mitigation programs at RBH. All wild Deschutes origin broodstock utilized for these programs will be live-spawned in order to minimize lethal take of these fish.

SECTION 9. INCUBATION AND REARING

Specify any management goals (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Data on survival by brood year and life stages for RBH are presented in Table 9.1.1 (see Attachment 17). RBH has adopted life stage specific survival goals from IHOT (1996) and targeted 95% survival from egg to smolt and 95 % from fingerling to smolt.

Wizard Falls does not spawn summer steelhead, RBH takes eggs and they are transferred to WFH in late February through March. WFH has the same survival goals as RBH, listed above.

9.1.2) Cause for, and disposition of surplus egg takes.

Extra eggs have been taken whenever possible in order to compensate for the epizootic outbreaks experienced at RBH over the years. In general, excess eggs are kept until the results of pathology have determined that the disease levels of parents or until excess fish are culled.

Excess eggs and fry are normally buried at the onsite landfill. This program needs to collect excess eggs generally due to its inability to meet egg to fry survival goals (Table 9.1.1, see Attachment 18).

Eggs will be collected at RBH and transferred to WFH for the reintroduction smolts. Any wild eggs collected will be given 1st priority for reintroduction purposes, first 20 adult pairs, and any surplus will go to integrating into RBH brood. Surplus eggs are not distributed to WFH.

9.1.3) Loading densities applied during incubation.

A maximum of 15,000 summer steelhead eggs are loaded per Heath tray at RBH. The hatchery has a capacity to incubate 2,145,000 steelhead eggs. Flow is normally 5 gallons per minute for each stack. Dissolved oxygen has been found to increase from top to bottom trays. One gallon plastic bottles are used to treat the inflowing water with formalin for 10 minutes at 1:600 concentration to combat soft shell disease and fungus.

At WFH, no more than 8,000 eggs, or 40 ounces, are loaded per tray. Flow is about 4 gallons per minute to each stack. Dissolved oxygen levels decrease as water travels through the stack. Bowls with lids are used to treat each stack with formalin for 10 minutes at 1:600 concentration to combat fungus.

9.1.4) Incubation conditions.

Approximately 50- 60 gallons per minute of incubation water can be chilled from 11° C temperature to 5° C at RBH. If the chillers shut down for some reason, water at ambient temperature will continue to flow over the trays. An alarm is set to alert hatchery personnel in case this situation happens. As opposed to chilling, water can be heated to a maximum of 14° C in order to accelerate egg development. This temperature control is needed to achieve a balanced incubation schedule because eggs are spawned over the run period. Chilling and heating technique for incubating eggs taken on different dates is an application that influences and unifies the embryonic development to achieve a common hatching and/or ponding date.

At WFH, the west Bank Spring is used for incubation of the summer steelhead eggs, which is a constant 50 degrees Fahrenheit. Each stack of incubator trays is armed with an alarm that notifies staff immediately in case water flow is disrupted.

9.1.5) Ponding.

The time for summer steelhead fry to be ponded at RBH is determined by thermal units that the eggs are exposed to during the incubation process (Table 9.1.5). Fingerlings are ponded when the majority has absorbed the yolk sac. As an example, summer steelhead were ponded at size 2,475 fish/pound in April, 2001.

Table 9.1.5. Incubation times required for summer steelhead at RBH (from Nyara 1989).

Species	Incubation temperature (° F)	Days to Shock	Thermal Units	Days to Hatch	Thermal Units	Days to Pond	Thermal Units
Summer Steelhead	57	16	400	22	550	50	900
Summer Steelhead	50	21	378	29	522	68	1075

Summer steelhead are ponded using thermal units, as well as visual cues such as when the yolk sac has been absorbed by the vast majority of fry at WFH. In April 2019, summer steelhead were ponded at 3,210 fish per pound and at 1,152 thermal units.

9.1.6) Fish health maintenance and monitoring.

Round Butte:

All eggs are treated with 1:100 parts of Argentyne for 10 minutes when they are first placed in the Heath trays. Additionally, a 1:600 solution of Formalin for 10 minutes is applied to the Heath trays daily until hatching, to control soft shell disease and fungus. Egg mortalities are picked with a machine after shocking, and handpicked with tweezers weekly thereafter.

Juvenile fish are rarely treated for external parasites at RBH because of the very low incidence of external parasites in the hatchery supply water. Juvenile fish are treated for

bacterial infections with oxytetracycline, aquamycin or florfenicol medicated food according to label, with a veterinary prescription or under an Investigational New Animal Drug (INAD) permit. Juveniles are examined at least monthly and more often as necessary. A representative sample of healthy and moribund fish from each lot of fish will be examined. The number of fish examined will be at the discretion of the fish health specialist. Appropriate actions including use of drugs or chemicals will be as recommended by pathologists. If a bacterial pathogen requires treatment with antibiotics, a drug sensitivity profile will be generated when possible.

Wizard Falls:

When eggs are received from RBH they are immediately treated with 1:100 parts of Ovadine for 10 minutes as they are put into heath trays. Eggs are also treated with 1:600 solution for Formalin for 10 minutes until hatching to control fungus. Eggs are received at the eyed egg stage so any egg mortality is accounted for prior to ponding.

Juvenile fish are usually treated with formalin during rearing at WFH for external parasites. Fish are also treated for bacterial infections with oxytetracycline, aquamycin or florfenicol medicated food. These treatments are veterinarian prescribed, according to labels, under a INAD drug permit. Fish health specialist will decide the number of fish to examine and recommend appropriate actions to take (i.e. drugs and chemical to treat fish).

Fish health status is determined prior to release or transfer to another facility. The examination for health status may occur during the regular monthly monitoring visit, i.e. within 1 month of release.

9.1.6) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

During incubation period, prophylactic measures will be taken to prevent fungal infections; and extra care will be taken to ensure water supply and prevent catastrophic equipment or system failure. Water system shall be equipped with alarm system to instantly notify hatchery personnel, in the case of system failure.

9.2) Rearing:

9.2.1) Provide survival rate data (average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

These data are presented in Table 9.1.1 for RBH and Table 9.1.2 for WFH (see Attachment 17).

9.2.2) Density and loading criteria (goals and actual levels).

At RBH the 6-ft diameter circular tanks are used for early rearing have a maximum loading capacity of 90 pounds of summer steelhead at 325 fish/lb. Actual densities may vary from year to year depending on the number of tanks available at the time. The

highest densities experienced at the hatchery Burrows raceways has been 7,400 pounds of summer steelhead at 3.8 fish/lb. Target loading in the spring is 150,000 fry per raceway. In late September, summer steelhead are loaded at a density of 42,000 per raceway. By the spring of the following year, the smolt sized fish are kept at a density of 28,000 – 30,000 per pond. Target density and loading goals and levels for steelhead at ponding are 0.52 lb/gal/min and 0.30 lb/cubic foot. Target goals at release are 11.25 lb/gal/min and 1.6 lb/cubic foot.

At WFH, 40'x 4'x 3.5' starter ponds used for early rearing are used until the fish are marked, in August. At this time fish are marked into bigger raceways. An average of 25,000 fish per raceway. The highest densities seen in these raceways has been 6,250 pounds at 4.0 fish/pound. Target density and loading goals for steelhead at ponding are 0.22 lbs/gal/min and 0.01 lbs/cubic foot. Target goals at release are 12.14 lbs/gal/min and 0.55 lbs/cubic foot.

9.2.3) Fish rearing conditions.

Round Butte:

Water for all rearing tanks is supplied from a spring in the west side of Round Butte Dam and has a constant temperature of 11°C and has good quality for fish culture. Initial rearing is accomplished in the 6-ft circular tanks. Water flow is set at 15 gpm and the amount of spin in the tank is adjusted to minimum. As the fish grow, the orientation of the inflow is changed to increase spin (Coriolus effect) in order to accommodate the distribution of different sizes of fish food.

Fish in the circulars are hourly fed a variety of commercial food pellets until they reach 800-900 fish/lb. The tanks are scrubbed with a brush and mortalities are picked out and discarded daily. Each circular tank has its own set of cleaning and picking tools to lessen the potential for disease cross contamination.

Summer steelhead are transferred to the Burrows raceways at about 300 fish/lb between May and July, depending on growth rates and pond availability. The transfer is accomplished manually, using barrels that can carry about 50 lbs of fish at a time.

Each Burrows pond is 75-ft wide X 16.1-ft long X 4-ft deep and contains about 9,100 gallons of water per foot of depth. Water levels are controlled by inflow and standpipes. Flow is about 400 gpm under normal conditions, and it is raised to as high as 900 gpm during the spring in steelhead smolt rearing ponds.

Wizard Falls:

Water for the starter ponds comes from either the West Bank Spring, a constant 50°F, or the East Bank Spring, a constant 44 °F. Currently, summer steelhead are raised on the West Bank spring.

Initial rearing happens in the 40'x 4'x 3.5' starter ponds where the flow is set to about 37 gpm starting out. As the fish grow, flow is increased to accommodate densities. Fish in starter ponds are fed twice per hour and are fed a variety of fish food pellets, sizes

dependent on size. Starter ponds are cleaned daily and are disinfected between each cleaning.

Summer steelhead are transferred to raceways at a goal of 100 fish/pound, as they are being clipped in August. The transfer is completed manually as fish are hand loaded into marking trailer and then transferred into the raceway after being clipped.

Each raceway is 100' X 20' X 4.5' and contains 9,000 cubic feet of water. Water levels are controlled by inflow, standpipes, and board height.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

During the early history of RBH, length information was recorded during studies reported by Lindsay et al. 1989 and Olsen et al. 1991. Since then, all production information is reported in weight. Table 9.2.4 presents data on average performance of RBH summer steelhead juveniles by time period.

Table 9.2.4a. Average monthly size for summer steelhead juveniles at Round Butte Hatchery by brood year.

	Target Growth	2004 BY	2005 BY	2006 BY	2007 BY	2008 BY
	Fish/lb	Fish/lb	Fish/lb	Fish/lb	Fish/lb	Fish/lb
Ponding	3200	2508	3285	2938	3055	3146
Week 2	2250	1700	2025	1394	993	1750
Week 4	695	750	788	700	600	725
Week 8	195	286	215	175	165	145
Week 12	100	90	118	95.5	96.9	88.4
Week 16	5605	49	7905	51	53.9	52.2
Week 20	35	38	42	26.5	31.9	26.6
Week 24	22	22.5	22.5	18	18.3	17.3
Week 28	17.8	14	14.5	12.5	13.9	12.3
Week 32	14	10.5	11.2	10.9	10.3	8.7
Week 36	11	7.8	8.6	7.9	7.6	7.8
Week 40	8	5.5	5.9	6.1	5.8	5.8
Week 44	6	4.5	4.8	5.2	4.5	4.5
Release	4	3.8	3.9	3.8	3.7	3.8

Table 9.2.4b. Average monthly size for summer steelhead juveniles at Wizard Fall Hatchery.

	Target Growth	2015 BY	2016 BY	2017 BY	2018 BY
	Fish/lb	Fish/lb	Fish/lb	Fish/lb	Fish/lb
Ponding			2,597	3,547	3,146

	Target Growth	2015 BY	2016 BY	2017 BY	2018 BY
May		1800	1528	1164	2765
June		630	488	375	806
July		185	226	164	315
August		125	128	92	158.5
September		59	85	43.8	84.1
October		34.5	35.9	26.8	43
November		24.5	23.7	17.5	27.5
December		18	14	21.5	18.6
January		14	10.8	10	13.5
February		10	7.2	8.9	10.3
March		7.9	6	7.5	7.8
Release		4	4.7	6.1	5.3

9.2.5) Indicate monthly fish growth rate and energy reserve data (average program performance), if available.

Data for energy reserves are not available for the RBH or WFH summer steelhead program. Food conversion ratios are presented in Table 9.2.5.a and 9.2.5.b

Table 9.2.5a. Average food conversion rates for summer steelhead juveniles at RBH, by brood year. An average cumulative conversion of less than 1.0 shows more than one pound of fish growth per pound of food fed.

STS Brood Year	Average Cumulative Food Conversion
6698 STS	1.00
6699 STS	1.09
6600 STS	.85
6601 STS	.87
6602 STS	.84
6603STS	.87
6604STS	.78
6605STS	.81
6606STS	.84
6607STS	.84
6608STS	.87

Table 9.2.5b. Average food conversion rates for summer steelhead juveniles at WFH, by brood year. An average cumulative conversion of less than 1.0 shows more than one pound of fish growth per pound of food fed.

STS Brood Year	Average Cumulative Food Conversion
66H15	0.85
66H16	0.77
66H17	0.76
66H18	0.79

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (average program performance).

Round Butte:

Food types are primarily dry commercial diets from a variety of different vendors. The medication is incorporated into a moist pellet provided by Bio-Oregon. Feeding strategy changes according to time of year and life stages of fish. Summer steelhead fry are fed 6 - 8 times a day, on demand. Medicated feed is fed at a rate of 2% body weight per day for a 28-day period. After the 28 day feeding, the fish are returned to a once a day schedule for 2 weeks, and then the medicated feed schedule is repeated. One month prior to release, they are fed on demand 5 days per week. Summer steelhead are fed based on aggressive feeding schedule up until release. This requires feeding them 4-6 times a day to get them to scheduled release size. Estimates of average food conversions are presented in Table 9.2.5.a

Wizard Falls:

Food types are primarily dry commercial diets from a variety of different vendors. Medicated feed is provided by Bio-Oregon. Feeding strategy changes depending on time of year and life stage of fish. Fry are fed all day 6-16 times a day until food is gone. Medicated feed is fed at a 2% body weight per day for a 10 day period. A month prior to release they are fed a transfer diet. Depending on feeding schedule and size of fish they will be fed between 5 to 7 days a week 4-6 times a day to get them to size.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

See Section 9.1.6

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

These data are not available for the RBH or WFH steelhead program. Usually fish age, size, body coloration, behavior, etc. are used as smolt development indices. No enzyme ATPase activities are measured.

9.2.8) Indicate the use of "natural" rearing methods as applied in the program.

No "natural" rearing methods are used by the RBH or WFH steelhead program.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Fish will be reared in water that passes through sand filters and ultraviolet (UV) sterilization at RBH, no UV system exists at WFH Fish will be fed prophylactic fish feed. Mortalities and excess fish feed will be removed from the rearing tanks on a daily basis. If high levels of mortality are experienced, fish will be tested to determine the cause of mortality and will be treated or destroyed dependent upon fish health results.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Target releases are 162,000 full term smolts into the lower Deschutes River at river mile 100 and 30,000 post smolts steelhead into Lake Simtustus for the mitigation program. Target releases are 100,000 full term smolts at multiple locations for the reintroduction program.

10.2) Specific location(s) of proposed release(s).

Deschutes River program

Stream, river, or watercourse:	Deschutes River
Release point:	River mile 100.1
Major watershed:	Deschutes River
Basin or Region:	Mid Columbia

Lake Simtustus supplementation

Stream, river, or watercourse:	Lake Simtustus
Release point:	Deschutes River Mile 104
Major watershed:	Deschutes River
Basin or Region:	Mid Columbia River Region

Reintroduction Program

Stream, river, or watercourse:	Deschutes River
Release point:	Multiple locations above Pelton Round Butte
Major watershed:	Deschutes River
Basin or Region:	Mid Columbia River Region

Reintroduction Program

Stream, river, or watercourse: Whychus Creek
Release point: Multiple locations above Pelton Round Butte
Major watershed: Deschutes River
Basin or Region: Mid Columbia River Region

Reintroduction Program

Stream, river, or watercourse: Crooked River
Release point: Multiple locations above Pelton Round Butte
Major watershed: Deschutes River
Basin or Region: Mid Columbia River Region

10.3) Actual numbers and sizes of fish released by age class through the program.

Release numbers and size at release for RBH steelhead from release year 1991 to 2002 are presented in Table 1.11.2b. Only full term steelhead smolts are released into the Deschutes River. Up to 30,000 post smolt at approximately 2.0 fish per pound are released into Lake Simtustus from late April through early June each year.

During Phase 3 of the reintroduction program, which will be initiated in 2020, 90,000 full terms smolts at approximately 5.0 fish per pound are planned to be released in the reintroduction area, 40,000 into the Crooked River basin and 50,000 into Whychus Creek, from mid-April through early May. Smolts will be transferred from WFH to the acclimation facilities on Whychus Creek, and Crooked River sites in Ochoco Creek, and at Opal Springs. DVWD releases approximately 6,000 smolts into the Crooked River as part of their mitigation obligations, also in an effort to bolster the Reintroduction efforts. Another 10,000 smolts are acclimated at the Opal Springs hatchery as part of the Reintroduction effort, not part of the mitigation release, are then transported from Opal Springs after the acclimation period and released at the Pelton Re-Regulation Dam in the lower Deschutes River.

10.4) Actual dates of release and description of release protocols.

Release dates for smolts released from RBH into the Deschutes are shown in Section 1.11.2 Table 1.11.2b. Transportation and release protocols are described below.

Release dates for smolts released from WFH are reliant on functional acclimation. Both the Whychus Creek and Opal Springs acclimation facilities are operational, but the live cars in Ochoco Creek present significant challenges, due to the need for the transfer to be timed with flow and the access to the site during the season. Ochoco Creek has plans for restoration by the private land owner and process could change once the restoration efforts are finalized, though this could not be until 2025. Proposed release dates are as follows: last week of March transport first round of smolts from WFH to acclimation facilities in each respective acclimation facility on the Crooked River and Whychus Creek, once smolts have been acclimated they will then be volitionally released from the acclimation sites. Both Ochoco Creek and and Opal Springs acclimation period will be between ten to 12 days. The fish on Whychus Creek will be acclimated for approximately

three weeks. Acclimation will start on third week of March for the first group of smolts, with acclimation ending the last full week of May. Ten percent of the overall smolt release of the 100,000 smolts slated for release in the Reintroduction program will be acclimated at Opal Springs hatchery for approximately 10 to 15 days. After the acclimation period, smolts will then be transported by truck and released at the Pelton Re-Regulation dam in the lower Deschutes River. The purpose of this short-term release strategy mentioned in the above sentences is to try to increase the number of adults returning to spawn in the Reintroduction area.

10.5) Fish transportation procedures, if applicable.

For the mitigation fish there is a 30-45 min transit from RBH to the release site at the base of the Pelton Regulation Dam at river mile 100.1. Fish transportation densities follow IHOT (1996) recommendations. Summer steelhead smolts are loaded at 1.0 to 1.1 lb/gal, depending on fish health.

Steelhead yearlings trucked to Lake Simtustus for release are loaded at a rate of 1.4 lbs/gal. Steelhead broodstock transported to RBH from the Pelton Trap are loaded at 0.5 lb/gal. No temperature control is needed for the short transit from RBH to ladder or release site. Oxygenation is provided by oxygen tanks and recirculation pumps.

For the reintroduction fish, eggs will be transported to Wizard Falls Hatchery for rearing. Once fish have reached full term smolt size they will be transported approximately 25 minutes to the Whychus Creek acclimation facility, 45 minutes to Ochoco Creek and Opal Springs facilities, both on the Crooked River. Once smolts have been acclimated for approximately 10 to 30 days, fish will then be volitionally released at these sites. For the next numbers of years, or until the release strategy is deemed invalid, a group of 10,000 smolts will be acclimated, likely at Opal Springs, for 10 to 12 days, loaded into transport trucks and hauled approximately 1 hour to be released below the Pelton Reregulation Dam at river mile 100.1. Fish transportation densities follow IHOT (1996) recommendations. Summer steelhead smolts are loaded at 1.0 to 1.1 lb/gal, depending on fish health.

10.6) Acclimation procedures.

No acclimation procedures are used for RBH steelhead.

An above ground acclimation facility is currently being utilized on Whychus Creek for the Reintroduction program. The facility uses an above ground Modutank, as described in section 4.1, that has a PVC liner in which water is pumped into the facility using an irrigation pump that is connected to pump screens, which are in accordance with both federal and state mandate screening. The outflow on the tank returns the water to Whychus creek at the same rate it is pumped into the tank. The outflow also has a screened stand pipe inside the tank so that the smolts can be released volitionally by removing the screen. Approximately 25,000 smolts will be transferred into the Whychus Creek acclimation facilities at a time and acclimated for 3 weeks before being volitionally released from the acclimation site on the second week of April. The fish that

did not exit the tank during volitional release, will be left over night and then be forced out of the tank the next day. The tank will then be drained, cleaned, and then another group of same number of smolts will be transferred into the acclimation facility. These smolts will also be held for 3 weeks and released on the first to second week of May. These release will follow the same protocol as mentioned above with volitional and forced releases.

Four live cars, as described above in Section 4, will be used on the Ochoco Creek for interim acclimation purposes. The live cars are placed in the water so that they are 3 quarters submerged in water. Approximately 2,000 to 2,500 smolts, depending on water levels in Ochoco Creek, are put into each live car, with a 10,000 smolts per release group being acclimated. There will be two different release groups acclimated at Ochoco Creek, with the total being approximately 20,000 smolts acclimated at the site. Smolts are acclimated in live cars between 8 to 10 days and then released. The landowner, the Deschutes Land Trust, plans to restore the property and restoration plans are currently being. The proposed restoration plans for the site include an acclimation site, either a pond with a release gate or a side channel with screening. Plans will be finalized and restoration is slated to begin on or before 2025, if necessary funding is found. Until the restoration is complete, acclimation will continue to occur in live cars or until another option is deemed better.

Opal Springs Hatchery is small hatchery facility, owned and operated by Deschutes Valley Water District (DVWD) that raises approximately 6,000 steelhead smolts for mitigation purposes that are volitionally released into the Crooked River as part of the Reintroduction effort. Once DVWD releases their mitigation smolts in early February, Reintroduction smolts will then transferred from WFH into the Opal Springs facility for acclimation purposes. Approximately 10,000 steelhead will be acclimated for 10 to 15 days prior to release, with three different release groups during the acclimation season. The two release groups of smolts will be volitionally released from Opal springs once the acclimation period has been complete. One release group, approximately 10,000 smolts, will be acclimated at Opal Springs and then transported by truck and released at the Pelton Re-Regulation dam, at river mile 100.1, in the lower Deschutes River.

Studies will be conducted to determine: condition of fish using condition factor; time of outmigration using a screw trap located downstream; time to collection at SWW; and any change in smolt to adult returns with incorporation of acclimation procedures. Groups of fish will also be PIT tagged to help determine the success of returning adults and their ability to hold back to return to individual tributaries in which they were released.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Summer steelhead smolts as part of the mitigation program are 100% double clipped utilizing an adipose and an alternating right or left maxillary, although other fin mark combinations have been used through time (Table 1.12a). The post smolt steelhead used for the harvest augmentation program in Lake Simtustus are 100% marked with an adipose and right pectoral combination. If, in the future, the decision is made to

substitute first generation progeny of wild X wild crosses for RBH hatchery stock in the downriver production program, the F1 fish will be differentially marked to distinguish them from other RBH stocks.

To differentiate reintroduction fish from other fish in the Deschutes basin, it was determined that a differential mark was warranted. A left maxillary clip is used for the hatchery reared smolts and a right maxillary clip for the naturally reared smolts. Adipose fins were left intact. The objective of marking the fish in this way is to differentiate returning reintroduction fish from the Round Butte Hatchery mitigation fish. If wild fish are used for the lower river mitigation brood, a differentiating mark will be given to wild fish so as to identify returning F1 adults. This identifying mark will assist hatchery staff so that at spawning time the fish can be segregated and spawned together. Also, because of current fishing regulations (which state that if any portion of the adipose fin is intact the fish must be released) leaving the adipose intact will allow for reduced in-river harvest impacts.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

All surplus RBH fish are humanely killed and buried, whereas in the unlikely event that excess wild fish are collected, they will be returned to the river.

10.9) Fish health certification procedures applied pre-release.

All fish receive a pre-release inspection by the ODFW Pathologist assigned to the facility, and only certified fish are released.

10.10) Emergency release procedures in response to flooding or water system failure.

There is no likelihood of flooding at the base of Round Butte Dam, which is a 350 ft high structure that holds back Lake Billy Chinook. Should there be flooding, release of fish would be the least of the problems. The water system is equipped with alarms so that failure is discovered before it becomes disastrous. If there be a complete and catastrophic system failure, the catastrophe will likely be so large that fish in captivity at that time will die.

There is not a likelihood of a flood event at WFH hatchery due to the fact that they Metolius is spring feed and there is no large fluctuation of flows. The acclimation facilities will have alarm systems that will alert staff if systems fail. The facilities will also have a backup generator on site if a power failure occurs. If the facilities cannot be turned back on in a timely fashioned, fish will be released from the acclimation facilities in an emergency situation.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Summer steelhead are released as full term, migration ready smolts in order to minimize

interaction with naturally produced fish. Additionally, RBH and WFH summer steelhead are all direct descendants of locally adapted, native stock. For fish released above PRB in support of reintroduction, the number of fish released is limited so as to reduce the impact on resident stocks. Precautions were taken during the development of the release goals so that the released fish in addition to the resident stocks would not exceed habitat capacity.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of “Performance Indicators” presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified for the program.

BENEFITS Performance Standards	BENEFITS Performance Indicators	BENEFITS Monitoring and Evaluation
It will be possible to identify summer steelhead released from RBH	All summer steelhead juveniles released from RBH will be fin marked such that they can be identified as to origin.	Fin mark summer steelhead juveniles at the appropriate time in their life. Conduct mark efficiency checks prior to release.
Healthy, full term summer steelhead smolts are released from RBH.	Release about 162,000 full term smolts annually.	Conduct appropriate disease checks and pre-release sampling for length-weight and other indicators of smoltification. Conduct post mark checks in time to remark if necessary.
Summer steelhead smolts released from RBH return as adults in sufficient numbers to contribute to subbasin and province sport and tribal harvest.	Adult returns are represented in province and, more importantly, subbasin sport and tribal harvest.	Conduct harvest sampling of sport and tribal fisheries in a manner that makes comparison to past data meaningful.
Summer steelhead smolts released from RBH return to that facility in sufficient numbers to meet FERC-mandated mitigation requirements.	Adult returns to the Pelton Trap to produce 162,000 smolts annually.	Operate the Pelton Trap to capture adult summer steelhead returns.
Summer steelhead smolts released from RBH return to that facility in sufficient numbers to meet in-hatchery brood stock needs.	Collect 188 adult summer steelhead at the Pelton Trap for mitigation program and approximately 92 adults for reintroduction program and transport to RBH for holding to maturity.	Operate the Pelton Trap to collect and enumerated RBH returns. Compare returns to past years and rearing/release strategies.
RBH and wild Deschutes origin adult returns will be utilized to initiate Reintroduction program	Produce eggs for transfer to another facility sufficient to produce smolts in support of Reintroduction program (currently 120,000 eggs).	Operate the Pelton Trap differentiate adult returns by fin mark. Genetically test wild broodstock to ensure that only fish of Deschutes River origin are utilized.

BENEFITS Performance Standards	BENEFITS Performance Indicators	BENEFITS Monitoring and Evaluation
Wild Deschutes origin adult returns in excess to needs of the Reintroduction program will be integrated into or substituted for RBH broodstock	In years where returns of wild adults are strong enough, a small number of Deschutes origin fish will be used for the reintroduction smolt program, surplus will be integrated into or substituted for RBH broodstock	Operate the Pelton Trap differentiate adult returns by fin mark. Genetically test wild broodstock to ensure that only fish of Deschutes River origin are utilized.

1.10.2) Performance Indicators – Risks

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
Adult summer steelhead returning to the Deschutes from RBH releases do not stray into other river systems.	Out of subbasin stray rates (as evidenced by fin mark or genetic analysis) of RBH steelhead into other systems.	Monitor steelhead fin marks and genetic composition in Hood River and other locations, as available.
Adult hatchery summer steelhead returning to the Deschutes will not comprise more than 10% of the spawners in the natural areas of the Deschutes.	In subbasin stray rates (as evidenced by fin mark or genetic analysis) of RBH steelhead into Warm Spring River, other Deschutes tributaries or the mainstem Deschutes.	Monitor steelhead fin marks and genetic composition WSNFH trap and during spawning ground counts in Deschutes tributaries.
Hatchery operations comply with water quality standards.	RBH meets the requirements of its NPDES permit and other permitting, as appropriate.	Environmental monitoring of appropriate water quality parameters conducted sufficient to meet reporting requirements.
Harvest of RBH summer steelhead adults minimizes impacts to listed species.	Numbers of non-target or wild salmonids caught in tribal and non-tribal fisheries and assumed hook mortality rates.	ODFW conduct harvest monitoring of sport and tribal fisheries. Appropriate enforcement to minimize illegal take.
Releases of summer steelhead smolts from RBH minimize interactions with wild fish by swiftly emigrating from the Deschutes.	Only full term, migration ready smolts will be released. Smolts will be fully acclimated to Deschutes water.	Appropriate downstream monitoring of RBH juvenile migration will be periodically conducted.
Minimize disease risk to wild fish from hatchery operation.	RBH operation conforms to all ODFW and other applicable fish health and operational guidelines.	Appropriate juvenile fish health monitoring will be conducted by ODFW pathologists. Wild juveniles will be periodically sampled to monitor disease load.
Life history characteristics of RBH summer steelhead do not diverge significantly from the wild population.	To the maximum extent possible, do not alter life history characteristics between the wild and hatchery groups.	Develop a program to periodically sample hatchery juveniles for phenotypic and genotypic characteristics in a manner that makes it possible to compare them to the wild steelhead population.
Genetic characteristics of RBH summer steelhead do not diverge significantly from the wild population.	To the maximum extent possible, do not alter genetic characteristics between the wild and hatchery groups.	Develop a program to periodically integrate wild Deschutes origin into RBH broodstock in a manner that

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
		does not jeopardize conservation status of the wild population.
Brood stock collection will maintain the run timing of the wild population	Run timing of the hatchery population does not differ significantly through time from the wild population	Compare run timing of the two groups at the Sherars Trap, at harvest census locations and at the Pelton Trap.
Reintroduction program will not adversely impact native populations above the Project.	Follow the parameters outlined in the Reintroduction Plan, do not exceed habitat capacity.	Monitor fish growth, distributions outmigration timing, reservoir passage and survival.

11.1.2) indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

PGE is committed to provide funding for all programs associated with its license requirements as specified above. ODFW plans to continue harvest monitoring and population estimate studies that are being conducted through funding provided by the US Fish and Wildlife Service’s Sport Fish Restoration Program.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring and evaluation activities are designed to minimize adverse genetic and ecological effects. All fish handling activities not associated with RBH either are covered or will be covered by the appropriate federal permitting.

SECTION 12. RESEARCH

In the recent past, ODFW Pathology conducted studies to provide a disease risk assessment associated with the passage of fish over the Project (Engelking 2002a; Engelking, in preparation). Additionally, OSU Microbiology Department conducted surveys to determine the level of risk associated with *Mxyobolus cerebralis* and *Ceratomyxa shasta* and fish passage (Bartholomew 2002; Sollid et al. 2001). Current and past studies by OSU Microbiology Department on the Klamath River are guiding development of studies on the dynamics of *C. shasta* transmission and parasite loads in the Deschutes River. These studies should inform biologists as to potential impacts of *C. shasta* on wild steelhead populations.

With the issuance of the FERC license in 2005, the Licensees are obligated to perform a series of Test and Verification (T&V) studies to determine impacts, changes, and success of the SWW and Fish passage facilities. These studies are being conducted on hatchery origin steelhead, natural origin fish are not involved or affected in any way. On an

annual basis the Licensees must submit an annual work plan, part of which describes in detail the T&V objectives and results. See section 12.5 for details of these T&V studies.

12.1) Objective or purpose.

See above Section 12. Past disease research has been conducted to better identify the presence of various fish pathogens and to initiate appropriate control methods.

12.2) Cooperating and funding agencies.

PGE and the Tribes are the main source of funds for this program, but RBH enjoys the cooperation of BPA and ODFW directly and members of the PRB Fisheries Committee. The Fish Committee consists of representatives from USFS, BLM, USFWS, BIA, NOAA, ODEQ, ODFW, NGO's, PGE and the Tribes.

12.3) Principle investigator or project supervisor and staff.

Principle investigator is Scott Patterson. Staff includes Rod French, Brett Hodgson, Taylor McCroskey, and PGE staff members Megan Hill, Terry Schrader and others.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

N/A

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

With the issuance of the new FERC License, the Licensees were required to evaluate the Round Butte Dam Selective Water Withdrawal Facility and associated downstream-passage, fish capture, fish transfer, and fish exclusion facilities through a series of evaluation studies as described in the Facility Evaluation Study Plan reviewed by the Fish Committee and filed with FERC. These studies have been completed and reports submitted to FERC. The Licensees are continuing to annually monitor injury, descaling, and mortality associated with of salmonids passing through and transported around the system; results are summarized in the Pelton Round Butte Project Fish Passage Annual Report.

With the issuance of the new FERC License, the Licensees were additionally required to implement a series of Test and Verification (T&V studies) research projects upstream and downstream of the Project. Annually the Licensees will develop an Annual Fish Passage Work plan. This plan contains a comprehensive list of the T&V studies for that particular year. The following is a list of specific T&V studies relevant to this HGMP:

- 1) Salmonid Rearing, Juvenile Density, and Habitat,
- 2) Juvenile Migration,
- 3) Reservoir Survival/Predation, Fishery, Disease, and
- 4) Adult Migration, Survival and Spawning.

The overall methods and framework for meeting the objectives of these T&V studies were described in the initial study plans filed at FERC in 2007-2009.

Specific objectives of the Salmonid Rearing, Juvenile Density and Habitat Test and Verification Study are to: 1) determine densities and sizes of different age groups of juvenile steelhead/roundtail in study reaches of Whychus and McKay creeks before and after steelhead reintroduction; 2) determine densities and growth rates of juvenile spring Chinook salmon in lower Whychus Creek and in the upper Metolius River rearing habitats after large-scale reintroductions and compare these to densities associated with earlier study releases; and 3) determine densities and growth rates of juvenile Chinook in rearing habitats in the lower Crooked and Deschutes rivers above Lake Billy Chinook after large-scale releases. The overall methods and framework for meeting these objectives are described in the study plan filed with FERC on June 19, 2007.

Below is a description of the work plan used as a basis to meet the objectives of the Salmonid Rearing, Juvenile Density, and Habitat T&V Study:

OBJECTIVE 1: Determine densities and sizes of different age groups of juvenile steelhead/roundtail trout (*Oncorhynchus mykiss*) in study reaches of Whychus and McKay creeks before and after steelhead reintroduction.

Study Sites:

Whychus Creek

Steelhead fry have been released into Whychus Creek annually since 2007. Fry releases are scheduled to be discontinued after 2019 and the reintroduction will only release smolts after 2020. Five sites sampled were chosen to represent the range of habitats available in Whychus Creek (Lewis 2003) and because pre-reintroduction roundtail trout density data were available for these sites. Reach 1 is located downstream of Alder Springs at river kilometer (rkm) 2.5. Reach 2 is located downstream of the US Forest Service Road 6360 crossing in the Crooked River National Grasslands at rkm 9. Reach 3 is located at Camp Polk, which is owned by the Deschutes Land Trust (DLT) at rkm 25.5, and Reach 4 is located downstream of Hwy 20 in Sisters at rkm 34.5. Site 5 is located at the Wolfree property (Reach 5; rkm 25).

McKay Creek

Reintroduction of steelhead fry began in McKay Creek in 2008. Fry releases are scheduled to be discontinued after 2019 and the reintroduction program will only release smolts after 2020. Two study reaches in McKay Creek have been monitored since 2005. Reach 1 is located at rkm 0.25, near the confluence with Crooked River. Reach 2 is located at rkm 5.6, upstream of the bridge on Grimes Rd. Two additional sites (reaches 3 and 4) above the Ochoco National Forest boundary were added in 2007. Reach 3 is located at rkm 0 on Little McKay and Reach 4 is located on McKay Creek at rkm 27 within the cattle grazing enclosure.

Methods:

A section of stream that is 200 m long where feasible (at least 100 m in length at all sites) containing at least one pool and one riffle will be selected in each stream reach (per Rosenberger and Dunham 2005 and Scheerer et al. 2007). These selections will be made during late summer/early fall, typically the low flow period of the year. Stream section dimensions (length and representative wetted widths) will be measured. If the stream or bank conditions have changed significantly, habitat will be surveyed according to ODFW stream survey methods (Moore et al. 2006). Blocknets will be utilized to keep fish from escaping from study reaches. Where possible, blocknets will also be placed midsection to evaluate the effectiveness of the blocknets.

Mark-recapture electrofishing will be conducted for each stream segment using one or two backpack electrofishers. After one electrofishing pass, all *O. mykiss* greater than 60 mm will be anaesthetized with MS-222, measured and given a caudal fin clip (*O. mykiss* >200 mm will be anaesthetized with carbon dioxide). We will alternate between upper and lower caudal clips to assess if blocknets are effective at preventing fish movement. After recovery, fish will be distributed back into the segment randomly. Fish will be left undisturbed for three hours (per Temple and Pearsons 2006). A subsample of all other fish species, and *O. mykiss* less than 60 mm total length (TL), will be measured and released outside of the study area.

After three hours, a second electrofishing pass will be conducted. *O. mykiss* greater than 60 mm will be measured. Marked and unmarked fish will be enumerated. If fewer than 20% of the total number of fish marked and released after pass one are recaptured, we will conduct additional recapture passes until the recapture of marked fish reaches the 20% threshold (a maximum of 4 passes will be conducted to minimize the effects of repeated electrofishing).

OBJECTIVE 2: Determine densities and growth rates of juvenile Chinook salmon in lower Whychus Creek and in rearing habitats in the upper Metolius River Basin after large-scale reintroduction efforts, and compare them to densities measured earlier in association with previous study releases.

Study Sites:

Metolius Basin

Five sites were chosen in 2008 to correspond to release locations and sites studied by Lovtang (2005). Two sites are located in the mainstem Metolius at rkm 77 (headwaters) and rkm 65 (Camp Sherman Campground). Three sites are located in Lake Creek at rkm 2 (Metolius Meadows), rkm 3.3 (Old 200 Bridge) and rkm 5 (Deschutes Land Trust property).

Deschutes Basin: Whychus Creek

Chinook fry have been released into Whychus Creek annually starting in 2009. In addition to recording Chinook catch during the annual redband electrofishing survey, seasonal snorkel surveys will be conducted on Whychus Creek. Three approximately

100-m sites were selected during 2009 pilot studies to correspond with electrofishing surveys. We will continue to conduct snorkel surveys at Sisters, Wolfree and Road Crossing.

Methods:

It is desirable to keep the methods as consistent as possible with studies conducted in the Metolius River Basin by Lovtang (2005) to allow comparison of current data with previously-collected data. At least initially, daytime snorkel surveys will be conducted seasonally in spring, summer and fall in the Metolius Basin and Whychus Creek to determine Chinook densities. In 2008 we found that night snorkel surveys were most effective in the mainstem Metolius while daytime surveys were effective in Lake Creek. Two snorkelers will make 2-3 upstream passes through the site, with each snorkeler covering an equal portion of the stream during each pass. Snorkelers will alternate between positions after each pass to control for bias. Chinook size class, and habitat unit will be recorded on a PVC cuff. If after two passes the Chinook snorkel counts are within 10% of each other, a third pass will not be conducted. A bounded count will be used to calculate density according to Dambacher (2002).

We will attempt to capture at least 20 fish by dipnet while snorkeling for growth measurements. In some instances in the past the total Chinook counts were fewer than 20 fish at some sites; the number of fish captured for measurements will have to be adjusted in these instances. Fish will be measured (TL and weight) and returned to the collection site. Growth will be calculated for the intervals between four sampling periods: release (winter), May-June (spring), July-August (summer), and September-October (fall).

OBJECTIVE 3: Determine densities and growth rates of juvenile Chinook salmon in rearing habitats in the lower Crooked and middle Deschutes rivers above Lake Billy Chinook after large-scale releases.

In 2011 we removed this objective from the study because in spring 2009 and spring and summer 2010, snorkel surveys were determined to be infeasible due to turbid conditions. Even when visibility permits snorkeling, the size and inaccessibility of the river makes quantitative sampling difficult. The densities of fish viewed during a couple of pilot snorkel surveys were not sufficient to allow us to capture Chinook by dip nets, seining or electrofishing. During 2010, we attempted to capture Chinook using minnow traps. No Chinook were captured; we caught one redband trout, a sculpin and crayfish.

Instead of attempting to collect data related to this objective, in 2011 we added several 100-m, haphazardly-selected snorkel sites in, Lake Creek and/or Whychus Creek. As in 2011, to allow us to cover more stream area, these sites will be snorkeled once in 2012 during the summer rather than the intensive multi-pass, multi-season method described in Objective 2. Numbers of Chinook will be counted and fish will be captured for measurements at a subset of sites. These sites will allow us to assess if our established monitoring sites are representative of the rearing habitat. In addition, this approach will provide distribution data which may be useful for reintroduction planning.

The Juvenile Migration and Reservoir Survival/Predation, Fishery, and Disease T&V study plans are both related to the evaluation of passage and survival from historic spawning and rearing habitats upstream of the Project down through Lake Billy Chinook and into the smolt capture facilities at Round Butte Dam. In 2015, the Licensees will continue to pursue the stated objectives of the Juvenile Migration T&V study as well as expand a radio telemetry study to focus on migration timing and survival of spring Chinook, steelhead and sockeye smolts from release below the Reregulating Dam to the mouth of the Deschutes River.

Below is a description of the work plan used as a basis to meet the objectives of the Juvenile Migration T&V Study (**Source: Quesada and Hill 2008**):

OBJECTIVE 1: Estimate the number of salmon and steelhead smolts entering Lake Billy Chinook (LBC) from each tributary.

Study Sites:

Fish traps will be operated in the Metolius River, Whychus Creek and Crooked River to capture downstream migrating smolts. Signs will be posted upstream of the traps to warn recreational users of potential hazards.

Metolius River

A 2.5-m rotary screw trap will be operated in the Metolius River near Monty Campground (Rkm 24) to all the Licensees to estimate Metolius in-river survival and validate independence of marking and recapture events.

Whychus Creek (Deschutes River)

A 1.5-m rotary screw trap will be operated in Whychus Creek near the Forest Service Road 6360 crossing (Rkm 9). This site is most downstream trapping site feasible in Whychus Creek. Flows may be inadequate during spring flows to dependably operate the screw trap; therefore, a small electric motor may be fitted to the front axle of the screw trap to assure continuous operation.

Crooked River

Two rotary screw traps may be operated in the Crooked River, one 2.5-m trap near the confluence with McKay Creek and possibly another at a downstream location if landowner access can be obtained.

Trap Operations:

Traps will be operated during the expected spring migratory season. Trap operations will begin in late February or early March and continue until the smolt catch diminishes, most likely in late May or June. The specific trap operation schedule will be decided on a weekly basis depending on anticipated water flows and fish catch rates. Traps will typically be operated a minimum of 4 days per week (Tuesday-Friday) throughout the migratory season. However, the traps may be operated 7 days/wk during peak migration

to reach desired sample sizes and determine trap efficiencies. The traps will be checked daily and captured fish will be enumerated by species. Steelhead and Chinook smolts will be measured (total length, weight) and checked for the presence of a PIT tag. If a fish is greater than 60 mm weighs more than 2.0 g, and does not have a PIT tag, a 12 mm full duplex PIT tag will be inserted. Fish less than 200 mm will be anaesthetized with MS-222; larger fish will be anaesthetized with carbon dioxide. A 12 mm PIT tag will be inserted into the peritoneal cavity of the fish via an incision or hypodermic needle. Captured fish will be released upstream of the fish traps to allow calculation of trap efficiencies. Release sites will be located at least two riffle/pool sequences upstream. Release sites will not be more than 300 m upstream of the trap to avoid substantial losses to marked fish due to predation. Time release live boxes will be used to release fish during the primary migratory period.

Smolts

At least 385 PIT tagged naturally reared smolts need to enter the reservoir from each tributary to achieve desired statistical precision. At the Crooked River and Whychus traps, it will be necessary to tag additional naturally reared smolts to compensate for in-river mortality and/or residualization. In previous radio tracking studies, 0-60 percent and 43-80 percent of radio-tagged hatchery steelhead smolts released into Whychus Creek and Crooked River, respectively, were detected entering the reservoir. Assuming sufficient numbers of outmigrants are captured at the upstream screw traps, the target of 385 PIT tagged smolts will be increased by 40 percent (e.g. to 539 total smolts) to account for expected in-river loss.

OBJECTIVE 2: Determine the timing and numbers of salmon and steelhead migrating from Lake Billy Chinook

All smolts captured at the Fish Transfer Facility (FTF) will be individually handled; timing and the exact number of fish emigrating from LBC will be reported. Smolts will pass through two PIT tag readers upon entering the FTF where PIT tag code and time will be recorded. Smolts will also be manually scanned for PIT tags, if a tag is not detected a 12 mm PIT tag may be inserted into the peritoneal cavity.

OBJECTIVE 3: Determine the percentage of fish entering Lake Billy Chinook that are successfully captured by the FTF.

Reservoir passage efficiency is defined as the percentage of fish entering LBC that are successfully captured by the FTF. Passage efficiency will be calculated for each migration season. However, if a significant portion of fish rear in LBC, these fish will not be detected until after estimates are computed. Therefore, separate passage efficiency will be calculated the year following, and will include estimates of reservoir rearing fish. Data regarding reservoir passage efficiency should be considered preliminary depending on SWW start-up timing and reservoir conditions.

The Reservoir Survival/Predation Fishery and Disease T&V Study was a three-year study scheduled to conclude in 2013. Specific objectives were to: 1) determine the migratory routes of Chinook salmon and steelhead trout in LBC. Determine potential delays in

smolt migration that occur in LBC and the Round Butte Dam forebay, 2) determine the relative impact of smallmouth bass, northern pikeminnow and bull trout to migrating salmonids in LBC, 3) quantify the number of smolts harvested by anglers in LBC, and 4) determine the impact of disease on anadromous smolts and bull trout in LBC. However, the need to continue portions of the study in 2015 was identified. In 2015, the Licensees will continue to collect and analyze data related to Objectives 1 and 4 of the study. The Licensees will study smolt migration behavior through LBC and evaluate the presence of overhead attraction water at the entrance of the SWW to increase fish collection efficiency. Additionally, a subsample of smolts captured during sampling activities at the FTF described above will be sacrificed for disease and ectoparasite screening. Ideally, 60 specimens will be collected for each species to increase statistical precision. The actual number taken will vary depending on species availability during sampling activities. Each fish will be individually bagged, labeled, set on ice and examined by the on-site ODFW fish pathologist within 24 hours for fish pathogens.

The Adult Migration, Survival and Spawning T&V Study will be conducted for With the issuance of the new FERC License, the Licensees were required to evaluate the Round Butte Dam Selective Water Withdrawal Facility and associated downstream-passage, fish capture, fish transfer, and fish exclusion facilities through a series of evaluation studies as described in the Facility Evaluation Study Plan reviewed by the Fish Committee and filed with FERC. These studies have been completed and reports submitted to FERC. The Licensees are continuing to annually monitor injury, descaling, and mortality associated with of salmonids passing through and transported around the system; results are summarized in the Pelton Round Butte Project Fish Passage Annual Report.

Below is a description of the work plan used as a basis to meet the objectives of the Adult Migration T&V Study (**Source: Quesada and Hill 2008**):

Pelton Adult Fish Trap Operations

Details of the Pelton Fish Trap operations can be found in the Pelton Fish Trap Operating Plan – Pre Fish Passage (Ratliff and Madden 2006). All maxillary clipped adults to be released in the upper basin will be given an anchor tag at the Pelton Fish Trap prior to their being trucked upstream for release. This will allow us to distinguish them from their conspecifics on the spawning grounds. Tag colors will be coordinated with the ongoing kokanee mark-resight study to prevent overlap.

Sample Size

As described in the overarching Adult Migration Study Plan (PGE and CTWSRO 2009), we will radio-tag a minimum of 10 adults per species and a maximum of 100 adults per species.

Fish Selection & Tagging Procedure

The tags will be allocated to the anticipated run timing based on historical data. Most tags will be outplanted during the peak of the run, with fewer tags assigned to the early/late portions of the run.

Fish will be implanted with esophageal tags manufactured by Lotek Wireless Inc (Newmarket, Ontario). Tag size will be dependent on the species (Ramstad et al. 2003) and likely be 3V or 7V tags with tag life ranging from 163 d-306 d with 2 seconds between bursts. Fish will either be anesthetized with MS-222, CO₂, electronarcosis, or placed in a fish restraint device (FReD) while implantation takes place. A 5-mm wide rubber or plastic band will be placed over the tag to increase tag retention (Keefer et al. 2004). Tags will be coated with glycerin and inserted through the mouth and into the stomach (Keefer et al. 2004). A dowel marked with predetermined increments will aid in tag insertion and assure its proper depth to increase retention and avoid injuring the fish. Fish will be held for no more than 24 hours before release into Lake Billy Chinook via the Round Butte Adult Release Facility.

Detection

Fixed radio telemetry stations will be set up at the upper end of the Deschutes, Crooked and Metolius arms of Lake Billy Chinook. Additional fixed radio telemetry stations may be established in the tributaries. All fixed stations will be programmed to run 24h/day, 7d/week and will be regularly downloaded and checked for proper operation. Fixed stations will record the date and time of detection, signal strength, and direction. Once telemetry stations confirm adults have entered a tributary, mobile tracking will ensue by foot, kayak or canoe. When a radio tagged fish is encountered, its condition will be recorded. The surveyor will record if the fish is on an active redd, and if there is spawning activity in the surrounding area. Locations will be recorded using GPS or detailed field maps. If there are fish that cannot be located during on-the-ground surveys, aerial tracking may be conducted at the end of the spawning season to locate these “lost tags”.

Redd Counts

A full redd count program, with randomly selected sites, is described in the Adult Migration Study Plan (Hill and Quesada 2009) and is to begin when it is determined that a full redd count program is feasible and will likely result in locating redds. Until then, we will focus our efforts on counting redds in dispersed areas around radio telemetered fish. In addition we will coordinate with the kokanee spawner surveys and bull trout redd counts to increase our detection of spawning Chinook and sockeye in the Metolius Basin. The duration of *O. mykiss* redd counts in Whychus Creek will be increased to detect spawning steelhead.

When a new redd is sighted, it will be identified as a “true” or “potential” redd based on the presence or absence of an obvious tailspill (per Dunham et al. 2001). Where a fish is present on a redd, its identity and approximate length will be recorded. The redd location will be recorded using either GPS or a detailed field map. The new redd will be marked with flagging that records the redd number and its potential or true status. When an old redd is encountered it will be recorded as measurable, no longer measurable, or no longer apparent (per Gallagher and Gallagher 2005). If the redd was recorded as a potential redd on the previous survey, it will be reexamined and be reclassified if appropriate based on its completion (per Gallagher and Gallagher 2005).

Data Analysis:

Migration Timing

Adult salmonids that received Passive Integrated Transponder (PIT) tags as juveniles will be detected as they migrate upstream of Bonneville Dam. This will allow us to calculate travel times for fish moving up the Columbia River. Additional PIT data may be available from the Sherars Falls fish ladder operated by ODFW. Migration timing for salmonids returning to the upper Deschutes River will be determined at the Pelton Fish Trap.

Migration timing above Round Butte Dam will be determined using radio telemetry data. Travel times will be calculated from the time that a radio-tagged fish is released in the dam forebay to the time it is detected at the fixed station arrays positioned at the mouths of the tributaries and potential locations described above.

Spawning Distribution

Spawning distribution will be determined by tracking radio-tagged fish and by using available redd and spawner survey data. At the end of the spawning season, surveyors will walk upstream 1 km of the most distant known spawner (from radio telemetry or redd counts) to look for evidence of additional spawning activity.

Spawning Abundance

Spawning abundance will be calculated by adjusting the number of adult salmonids released at the forebay for pre-spawning mortality based on the proportion of radio tagged fish that successfully reach the spawning grounds. When the complete redd survey program is initiated, this will be used to generate a second independent abundance estimate.

Interspecific Spawning Competition

Bull trout, sockeye and Chinook salmon spawn timing and distribution will likely overlap in the Metolius Basin. Visual observations during radio telemetry, redd surveys and spawner surveys will help to determine how much spatial and temporal overlap occurs. Species identification will be aided by the insertion of anchor tags in anadromous fish returning to the Pelton Fish Trap. Redd size and location may also be used to distinguish species in some instances (Gallagher and Gallagher 2005).

Survival to Spawning

Survival to spawning will be calculated as the proportion of radio-tagged fish that successfully reach the spawning grounds and are relocated in the proximity of a redd.

12.6) Dates or time period in which research activity occurs.

See 12.5.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

See 12.5

- 12.8) Expected type and effects of take and potential for injury or mortality.**
See 12.5
- 12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).**
See 12.5
- 12.10) Alternative methods to achieve project objectives.**
See 12.5
- 12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.**
See 12.5
- 12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.**
See 12.5

SECTION 13. ATTACHMENTS AND CITATIONS

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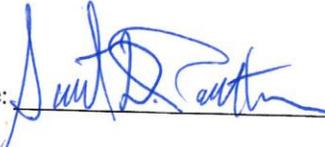
SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name and Title of Applicant: Rod French, Deschutes Watershed District Fish Biologist

Signature:  Date: 9/10/2020

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature:  Date: 9/27/2020

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

A.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

Section 7 Consultation, Biological Opinion on Artificial Propagation in the Columbia River Basin: incidental take of listed salmon and steelhead from federal and non-federal hatchery programs that collect, rear and release unlisted fish species (NMFS 1999a).

A.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Bull trout, *Salvelinus confluentus*, are indigenous to the subbasin and are found in the lower Deschutes River below Pelton Reregulating Dam, Shitike Creek and the Warm Springs River. A BPA funded biological and habitat inventory to determine suitability of White River above White River Falls for anadromous introduction was completed in 1985 and bull trout were not found in White River above White River Falls (ODFW et al. 1985). Anecdotal information suggests that, historically, distribution of bull trout in the Deschutes River subbasin was likely wider than it is today.

More than one bull trout population or subpopulations likely occupied the Deschutes River basin and there was probably interchange between these subpopulations. A variety of factors including construction of Crane Prairie (1922) and Wickiup (1947) dams and introduction of brook trout likely contributed to the extinction of upriver subpopulations in the 1950's. Construction of Pelton (1956) and Round Butte (1964) dams and termination of fish passage around these structures in 1968 greatly restricted or eliminated migration of upriver groups of bull trout into the lower Deschutes River. Fluvial subpopulations in Shitike Creek and the Warm Springs River did and likely still do contribute bull trout into the lower Deschutes River.

Bull trout have rarely been documented in the lower Deschutes River downstream from Sherars Falls (river mile 43). The Sherars Falls adult salmon and steelhead trap, located in the fish ladder at Sherars Falls, has captured one bull trout in 5 years of operation from mid-April through October or in 22 years of operation from mid-June to early July through October. Small anadromous individuals (jack salmon) and resident rainbow trout are routinely captured at this facility and bull trout would be vulnerable to capture. It is possible that bull trout can negotiate Sherars Falls during high spring flows and likely did prior to construction of the fish ladder in the 1920' or 1930's.

Drift boat mounted electrofishing surveys have been conducted sporadically for spring Chinook, summer steelhead, and rainbow trout downstream from Sherars Falls since the early 1970's and no bull trout have been sampled in this reach by electrofishing. Additionally, harvest estimates of summer steelhead and spring Chinook utilizing creel

census have been conducted downstream from Sherars Falls at a variety of locations annually since 1970. One bull trout was sampled from a tribal dipnet at Sherars Falls in 2003.

Quantitative estimates in the form of population estimates or relative abundance indices for any life stage of bull trout in the mainstem lower Deschutes River are not available. Bull trout have been captured in the mainstem lower Deschutes River above Sherars Falls during rainbow trout population estimate work but at numbers lower than those needed to make statistically sound population estimates. Bull trout abundance in the subbasin is likely low.

Anecdotal information suggests that bull trout in the lower Deschutes River subbasin were more abundant historically than at present. A fish trap was used to pass upstream migrating salmonids over Pelton Reregulating Dam prior to 1968. Workers at that facility recall annually passing up to several hundred large bull trout there for a number of years indicating that bull trout were much more abundant historically (Ratliff et al. 1996).

It is not known if a resident population exists in the lower Deschutes River or if fish observed there are all members of fluvial populations. Completion of Round Butte Dam in 1964 and the subsequent abandonment of downstream fish passage facilities in 1968 effectively isolated bull trout subpopulations in the Metolius from those in the lower Deschutes River subbasin.

The Warm Springs River and Shitike Creek populations of bull trout are thought to be fluvial but may contain a resident component as well. The fluvial components of these populations spawn and rear in headwater reaches or smaller streams tributary to the Warm Springs River and Shitike Creek. Juvenile and sub-adult individuals migrate to the mainstem lower Deschutes River to rear for a period of years. An upstream spawning migration into the smaller tributaries takes place with the onset of maturity. The only known suitable spawning sites in the subbasin are contained in the Warm Springs River and Shitike Creek.

No bull trout tagged during rainbow trout population estimate work have been recaptured at trap facilities or by anglers; therefore, quantitative data on frequency, rate, and direction of movement is lacking for subbasin populations. Qualitatively, however, movement is known to occur within the subbasin. It is believed that the fluvial component of the Warm Springs River and Shitike Creek populations migrate downstream into the lower Deschutes River to rear. Juvenile and sub-adult bull trout are periodically captured in very small numbers in the Humphrey trap in the Warm Springs River. Small but increasing numbers of large, presumably adult, bull trout are captured at the barrier dam and associated fish trap at WSNFH. Bull trout captured at this site were not counted prior to 1990 and were killed rather than passed upstream. It is assumed that this movement is associated with a spawning migration.

Low numbers of bull trout have been captured at the Pelton Trap in recent history (Table 15.3 see Attachment 18). These fish were not enumerated prior to late 1991 and were killed at this facility prior to the 1990's.

Size and bag limit regulations on the lower Deschutes River have likely precluded a target bull trout fishery and limited exploitation rates to very low levels. The taking of bull trout was banned by rule in the mainstem lower Deschutes River starting in 1994.

A.3) Analyze effects.

The RBH steelhead program likely has little direct, indirect or cumulative effects on bull trout populations in the Deschutes River although the amount of interaction between the two groups and the effects of this interaction is unknown.

Operation and maintenance of RBH likely has no effect on bull trout. The hatchery water supply and the footprint of the facility are both so closely associated with Round Butte Dam that their effect on bull trout would not be measurable. Discharge of hatchery effluent is directly into Lake Simtustus and local, state and federal water quality and dilution rates are met. No further habitat modification specific to the operation or maintenance of RBH is planned. Off normal operation of RBH is not anticipated and any emergency condition at the hatchery involving Round Butte Dam would be catastrophic.

The majority of bull trout in the lower Deschutes subbasin exhibit a fluvial life history pattern. Adults spawn and rear near the headwaters of the Warm Springs River and Shitike Creek. Juveniles rear for two to three years in these streams before migrating to the Deschutes River. Adults return to their natal streams to spawn beginning at age 4 (Brun and Dodson, 2000). This fluvial life history pattern provides spatial separation between the more sensitive juvenile life history phase of bull trout RBH steelhead and the two likely have no interaction.

Returning RBH adults are also spatially and temporally separated from spawning bull trout. Bull trout are known to be fall spawners and require cold water, complex instream habitats and clean gravels for successful spawning. These habitats are present in the Warm Springs River upstream from WSNFH and, as discussed above, hatchery steelhead are not allowed access to that area. Bull trout spawning habitat in Shitike Creek are likely near the upper distribution of summer steelhead spawning.

As discussed above, RBH has a track record of releasing full term, migration ready summer steelhead smolts that migrate quickly through the lower Deschutes and likely have little opportunity to interact with adult bull trout present there. There is no indication that there are disease transfer between the two groups. The RBH smolts are not released unless they have received disease clearance from ODFW pathologists. It is possible that adult bull trout actually use RBH steelhead smolts as a prey base, potentially a benefit for bull trout from this steelhead program operation.

As mentioned above, bull trout were killed at both the Pelton Trap and at WSNFH but this practice, common at the time, was stopped years ago. It is unknown how many bull trout were killed at the Pelton Trap. Since records have been kept of bull trout capture at that facility, no direct mortality has been documented. As detailed under sections dealing with

adult fish handling at the Pelton Trap above, the possibility of direct take of bull trout is thought to be extremely low.

A.4) Actions taken to minimize potential effects.

Operation of the RBH summer steelhead program is thought to have no effect to bull trout in the lower Deschutes River. The facility and program will continue operation as before and all previous actions thought to minimize potential effects to bull trout will continue. If any lethal take of bull trout occur it will be reported to ODFW and the USFWS.

A.5) References of Addendum A.

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Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Bull trout, ESU/Population: Columbia/Mid-Columbia Activity: Pelton Trap Operation				
Location of hatchery activity: RM 100 Deschutes River, Dates of activity: January through December, Hatchery program operator: ODFW				
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			110	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			1	
Other Take (specify) h)				

- a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
- b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
- c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
- d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
- e. Listed fish removed from the wild and collected for use as broodstock.
- f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
- g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
- h. Other takes not identified above as a category.

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.

Attachment 1

Table 1.8.1 Initial estimates of annual releases of summer steelhead to occur within specific areas of the drainage basin upstream of PRB as the reintroduction effort moves forward. Parental origin (brood) is identified as being Hatchery (H), Mixed (M), or Wild (W; this category includes steelhead parents that are the first-generation, hatchery-reared offspring of wild fish).

Species	Phase of reintroduction	Stream area	Fry		Smolts	
			Brood	Number	Brood	Number
Summer steelhead	Phase 1	Deschutes R.	---	0 ^a	---	0 ^a
		Whychus Cr.	H	286,000 ^b	H	5,000 ^b
		Crooked R. system	H	288,000 – 708,000	H	7,500 ^c
		All	H	574,000 – 994,000	H	12,500
	Phase 2	Deschutes R.	---	0 ^a	---	0 ^a
		Whychus Cr.	W, M, H	100,000-596,000 ^d	W	7,700 ^d (one generation)
		Crooked R. system	W, M, H	222,000-1,417,000 ^d	W	13,000 ^d (one generation)
		All	W, M, H	322,000 - 2,013,000	W	20,700

^a There will be no releases of steelhead directly into the Deschutes R., nor into the Metolius R. system. Habitat in these areas is believed to be better suited to resident than anadromous rainbow trout production (Cramer and Beamesderfer 2006), and colonization of this habitat by steelhead, should it occur, will be a consequence of straying by naturally produced fish.

^b Initial annual releases into Whychus Cr. will be intended to supply enough marked smolts (both naturally produced and hatchery produced) to test fish passage effectiveness downstream through LBC and into the SWW fish collection facility. The releases of fry assume 10 percent of the smolts naturally produced in the stream will be trapped and reach the head of the reservoir bearing detectible marks, and have been increased by 20 percent above the minimum number estimated to be needed for adequate statistical precision in the fish passage tests (238,000). Initial fry releases will also test fish performance in the habitat above PRB and produce the first generation of adult steelhead to have reared as juveniles in that habitat for about 40 years. Numbers of fry to be released assume smolt production only in suitable habitat below the TSID diversion dam and not above that dam.

^c Initial annual releases into the Crooked R. system below Prineville will be intended to supply enough marked hatchery smolts to test fish passage effectiveness downstream, and to provide naturally produced smolts that can be marked and pooled with those from Whychus Cr. to potentially make fish passage tests based on naturally produced smolts more robust. The releases of fry will also be intended to help test fish performance in the habitat above PRB and to produce returning adults that reared as juveniles in that habitat. As currently envisioned, the scope of steelhead fry releases during Phase 1 will be relatively limited.

^d Annual releases during Phase 2 will supplement natural fish production associated with returns of adult steelhead that reared as juveniles above PRB. Releases of fry will initially be of a magnitude estimated to be sufficient by themselves to produce about 50 percent of the maximum number of smolts, including that in areas of Whychus Cr. above the TSID diversion dam, and will diminish through time (note: the percentage will be reduced very early in Phase 2 if the number of returning adults exceeds expectations and there is a potential that fry outplants might otherwise overwhelm the offspring of these adults). There may be exceptions to this basic pattern in the Crooked R. system, however. Actual annual releases of fry will depend on broodstock availability and, in the Crooked R. system early in Phase 2, anticipated post-release environmental conditions. Hatchery produced smolts derived from disease-screened wild parents collected below PRB will also be released into these areas for a 5-year period, if available, in numbers equivalent to 50 percent of maximum natural smolt production, so that adults returning from the releases can also begin to supplement the developing natural runs. Hatchery support of the natural runs will diminish through time and end as soon as the runs can sustain themselves. Barring unforeseen circumstances, it will not continue for more than three fish generations in a given subbasin before the fish are given an opportunity to sustain themselves without artificial support.

Attachment 2:

Table 1.12 a. Estimated smolt to adult (mouth of the Deschutes) survival of RBH summer steelhead, by brood year, 1987 through 1999.

BY	Fin Mark	Number Released	1-salt Year	2-salt Year	Below Sherars Harvest a/	Above Sherars Popn Est	Total to mouth of Deschutes	Total BY Survival as Return to Mouth of Deschutes
87	ADRVRM	53,402	89			827		
				90		418		
					314	1245		
87	ADRVLM b/	109,117	89					
				90		827		
					695	1087		
			BY BELOW HARVEST		1009	1914	2923	1.80%
88	ADRPLM	52,128	90			112		
				91		504		
					82			
88	ADLPLM	62,906	90			98		
				91		504		
					86			
88	ADRPRM	43,188	90			149		
				91		504		
					41			
			BY BELOW HARVEST		209	1871	2080	1.31%
89	ADLM	108,683	91			1133		
				92		334		
					112			
89	ADRM	52,925	91			1133		
				92		1532		
					252			
			BY BELOW HARVEST		364	4132	4496	2.78%
90	ADRP	107,795	92					
				93				
					172			
90	ADLP	55,570	92					
				93				
					133			
			BY BELOW HARVEST		309	1748	2057	1.26%
91	ADRM	108,682	93					
				94				
					29			
	ADLM	52,890	93					
				94				
					4			
			BY BELOW HARVEST		33	287	320	0.20%
92	ADRP	111,908	94					
				95				
					224			
92	ADLP	54,235	94					
				95				
					141			
			BY BELOW HARVEST		365	3518	3883	2.34%
93	ADLM	164,961	95					
				96				
			BY BELOW HARVEST		481	3730	4211	2.55%
94	ADRM	167,198	96					
				97				
			BY BELOW HARVEST		728	5055	5783	3.46%

BY	Fin Mark	Number Released	1-salt Year	2-salt Year	Below Sherars Harvest a/	Above Sherars Popn Est	Total to mouth of Deschutes	Total BY Survival as Return to Mouth of Deschutes
95	ADLP	159,631	97					
				98				
		BY BELOW HARVEST			432	4819	5251	3.29%
96	ADLM	157,233	98					
				99				
		BY BELOW HARVEST			270	2733	3003	1.91%
97	ADRM	173,162	99					
				00				
		BY BELOW HARVEST			814	4261	5075	2.93%
98	ADRV	166,504	00					
				01				
		BY BELOW HARVEST			554	3993	4547	2.73%
99	ADLM	162,005	01					
				02				
		BY BELOW HARVEST			1340	11207	12,547	7.74%
00	ADRM	166,126	02					
				03		N/A		
		BY BELOW HARVEST			1005		N/A	N/A
01	ADRV	159,62	03					
				04				
		BY TOTAL HARVEST						
02	ADLM	169,835	04		201	1000		
				05	401	1176		
					602	2176	2778	1.64%
03	ADRM	167,835	05		303	1263		
				06	244	763		
					547	2026	2573	1.55%
04	ADLM	156,939	06		548	880		
				07	245	725		
					1293	1605	2898	1.85%
05	ADRM	176,135	07		758	1518		
				08	249	796		
					1007	2314	3321	1.89%
06	ADLM	171,464	08		9115	2081		
				09				
07	ADRM	173,788	09					
				10				
08	ADLM	188,018	10					
				11				

a/ Total estimated catch by sport anglers below Sherars Falls and tribal fishers at Sherars Falls.

b/ Released at Maupin. All others released at the Regulation Dam

Attachment 3:

Table 1.12b Viability assessment results for Mid-C steelhead populations in the Deschutes River Basin (Carmichael and Taylor 2010).

Population	Extant/ Extinct	Abundance		Productivity		Goal A	Goal B		
			Lower		Lower	Natural			
		Mean	90%	Mean	90%	A/P Risk	Processes Risk	Diversity Risk	Integrated SS/D Risk
Deschutes River Eastside	Extant	1,599	896	1.89	1.1	Low	Low	Moderate	Moderate
Deschutes River Westside	Extant	456	306	1.05	0.76	Low	Low	Moderate	Moderate
Deschutes Crooked River	Extinct	0	NA	0	NA	Extinct	NA	NA	NA

Attachment 4:

Table 1.12c. Number and percent composition of summer steelhead in Pelton Trap, by run year.

RunYear	Wild		Round Butte Hatchery a/		Stray Hatchery	
	Number	Percent	Number	Percent	Number	Percent
1971	394	11	3,166	89	14	1
1972	387	14	5,409	85	30	1
1973	142	3	4,828	96	37	1
1974	227	3	6,811	96	27	1
1975	169	9	1,739	89	48	2
1976	244	18	1,083	80	29	2
1977	233	10	2,120	87	80	3
1978	136	7	1,732	88	110	5
1979	223	8	2,612	90	54	2
1980	169	7	2,195	91	47	2
1981	245	11	1,760	82	156	7
1982	344	17	1,547	75	167	8
1983	814	17	2,439	52	1,452	31
1984	603	13	3,278	70	795	17
1985	686	14	3,153	66	943	20
1986	467	10	2,640	57	1,538	33
1987	46.	7	1,484	61	796	32
1988	123	7	1,247	75	300	18
1989	136	9	829	56	524	35
1990	82	7	606	54	428	38
1991	101	6	1,365	59	849	37
1992	59	4	1,157	70	427	27
1993	65	12	190	35	288	53
1994	27	2	753	53	642	45
1995	32	2	999	50	977	49

Table 1.12c continues

Table 1.12c (cont). Number and percent composition of summer steelhead in Pelton Trap, by run year.

RunYear	Wild		Round Butte Hatchery a/		Stray Hatchery	
	Number	Percent	Number	Percent	Number	Percent
1996	126	2	3,605	63	2,001	35
1997	194	4	2,440	48	2,459	48
1998	155	6	1,135	44	1,284	50
1999	83	4	1,005	55	768	40
2000	114	4	1,593	57	1,103	39
2001	282	3	4,942	56	3,674	41
2002	207	3	4,284	68	1787	29
2003	104	3	2605	71	967	26
2004	79	3	2143	69	903	29
2005	97	2	3017	77	804	21
2006	202	3	3706	62	2098	35
2007	135	3	3543	65	1734	32
2008	178	4	3109	76	803	20
2009	398	5	4806	63	2413	32
2010	215	5	3130	72	981	23
2011	138	5	2441	84	325	11
2012	158	3	1888	84	287	13
2013	64	4	1258	78	287	18
2014	174	6	2576	82	390	12
2015	57	2	2207	89	215	9
2016	43	2	2,098	90	175	7
2017	32	2	1697	89	158	8
2018	32	2	1439	91	110	7

Table 1.12c ends

a/ Round Butte Hatchery refers to hatchery steelhead from Deschutes stock that were reared at Oak Spring, Wizard Falls, Cedar Creek and Gnat Creek hatcheries prior to 1973 and at RBH starting in 1973.

Attachment 5:

Table 1.16.1a Estimated smolt to adult return (SAR) rates of Round Butte stock summer steelhead by brood releases and adult estimates to the mouth of the Deschutes River, Sherars Falls, and the total captured at the Pelton Trap, 2003 to 2016.

Release Year	Mark	Number Released	Adult Estimate to Mouth of Deschutes	Adult Estimate to Sherars	Adult Capture at the Pelton Trap	SAR Rates		
						Mouth of Deschutes	Sherars Falls	Pelton Trap
2003	ADLM	169,835	5,460	4693	2,728	3.2%	3.0%	1.6%
2004	ADRM	167,534	5,558	4851	3,182	3.3%	3.0%	1.9%
2005	ADLM	156,939	5,822	4976	3,005	3.7%	3.3%	1.9%
2006	ADRM	176,135	7,019	5989	3,017	4.0%	3.5%	1.7%
2007	ADLM	178997	6,881	5899	3,706	3.8%	3.4%	2.1%
2008	ADRM	173,788	10,637	9802	3,541	6.1%	5.7%	2.0%
2009	ADLM	188,018	6,104	4970	3,109	3.2%	3.0%	1.7%
2010	ADRM	179,871	5,554	4803	4,806	3.1%	2.8%	2.7%
2011	ADLM	177,866	3,620	3140	3,130	2.0%	1.9%	1.8%
2012	ADRM	178,151	5,474	4878	2,398	3.1%	2.8%	1.3%
2013	ADLM	170,849	2,259	1,854	1,899	1.3%	1.2%	1.1%
2014	ADRM	179,176	5,433	5,032	1,208	3.0%	2.9%	0.7%
2015	ADLM	179,608	1,352	412	1,981	0.8%	0.7%	1.1%
2016	ADRM	178,251	4,113	3,787	2,162	2.3%	2.2%	1.2%

Attachment 6:

Table 1.16.1b Summer steelhead redd counts in Bakeoven and Buckhollow Creek from 1991 to 2005. Redd counts after 2006 were not comparable because landowner denied access to significant portion of streams. Redd surveys were discontinued after 2005 due to lack of landowner access to property.

	Bakeoven Creek	Buckhollow Creek
1991	8	72
1992	9	34
1993	21	48
1994	13	8
1995	20	69
1996	35	65
1997	57	136
1998	68	179
1999	89	152
2000	83	110
2001	480	445
2002	214	221
2003	117	222
2004	87	211
2005	58	114

Attachment 7:

Table 1.16.1c. Estimated number of stray steelhead that migrated past Sherars Falls and those estimated to remain available to spawn, by run year. (% of Peterson estimate estimated to remain upstream from Sherars Falls.)

RY	Peterson Estimate	Above Sherars Harvest a/	Pelton Trap Catch	WSNFH Trap Catch	Total Remaining Above Sherars
90	2852	368	428	123	1933(67.8)
91	8409	402	849	374	6784 (80.7)
92	4261	877	427	400	2557 (60.0)
93	4293	675	288	192	3138 (73.1)
94	4391	591	642	18	3236 (73.7)
95	11855	937	977	168	9773 (82.4)
96	23618	532	2001	349	20,736 (87.8)
97	17703	435	2459	380	14,429 (81.5)
98	11110	395	1284	82	9349 (84.2)
99	13785	1186	768	421	11410 (82.8)
2000	15072	872	1103	319	12,778 (84.8)
2001	25263	2078	3674	988	18523 (73.3)
2002	15203	1777	1787	578	11061 (72.7)
2003	6542	782	967	182	4611 (70.4)
2004	4949	669	903	61	3316 (67.0)
2005	4838	940	804	86	3008 (62.2)
2006	19189	859	2098	278	15954 (83.1)
2007	7929	1256	1734	153	4786 (60.3)
2008	9498	1085	803	58	7552 (79.5)

RY	Peterson Estimate	Above Sherars Harvest a/	Pelton Trap Catch	WSNFH Trap Catch	Total Remaining Above Sherars
2009	15768	3327	2412	251	9778 (62.0)
2010	5101	1111	981	Na	3009 (59.0)
2011	5363	1000	325	14	4024 (75.0)
2012	4336	532	422	60	3322 (76.7)
2013	2884	379	287	63	2155 (74.7)
2014	2002	555	255	34	1158 (57.8)
2015	1926	773	213	234	706 (36.7)
2016	553	283	91	Na	179 (32.3)
2017	1039	238	161	5	635 (61.1)

a/ Punchcard catch not available. Calculated from estimated RBH origin catch times RY 90 – 2002 average percentage of stray hatchery fish in Peterson estimate of total hatchery fish above Sherars (69.9%)

b/ - does not include above Sherars harvest

Attachment 8:

Table 2.2.2a. Number of wild and hatchery origin steelhead captured at Warm Springs National Fish Hatchery, 1982-2003.

BROOD YEAR	WILD				HATCHERY			
	M	F	Unk	TOTAL	M	F	Unk	TOTAL
1982	196	373		569			40	40
1983	56	199		255			35	35
1984	174	257		431			129	129
1985	2000	388		577			89	89
1986	133	240		373			56	56
1987	234	588		822			692	692
1988	131	391		522			699	699

BROOD	WILD				HATCHERY			
	YEAR	M	F	Unk	TOTAL	M	F	Unk
1989	123	262		385			205	205
1990	130	209		339			182	182
1991			165	164			129	129
1992			280	280	9	5	383	397
1993	24	44	13	81	5	3	107	115
1994	33	41	61	135			147	147
1995	47	37	11	95	4	6	96	106
1996	29	50	7	85	32	24	112	168
1997	92	119	32	243			349	349
1998			214	214			380	380
1999	19	28	52	98	11	13	58	82
2000			325	325	16	4	401	421
2001			509	509	20	39	260	319
2002			734	734	7	17	964	988
2003			880	880			578	578
2004a/				282				182
2005				321				61
2006				256				86
2007				395				278
2008				305				155

a/ steelhead were not broken out by sex after 2003

Attachment 9:

Table 2.2.2b. Summer steelhead redd surveys in the Trout Creek drainage, by year. Data should not be compared before and after 1993 due to differences in methodology and location.

Year	Miles Surveyed	# of Fish	# of Redds	Fish/Mile	Redds/Mile
1988	9.4	17	23	1.8	2.5
1989	10.5	24	23	2.8	2.2
1990	14.4	22	42	1.5	2.9
1991	16.9	3	16	0.2	1.1
1992	16.4	6	6	0.4	0.4
1993	28.2	4	15	0.1	0.5
1994	16.25	0	0	0.0	0.0
1995	18.25	0	8	0.0	0.4
1996	21.75	4	5	0.2	0.2
1997	23.6	21	50	0.9	2.1
1998	28	13	44	0.5	1.6
1999	28.65	12	59	0.4	2.1
2000 a/	54.1	39	461	0.7	8.5
2001	36.6	56	595	1.5	16.3
2002	65.2	95	866	1.5	13.3
2003	65.4	48	789	0.7	12.1
2004	64.1	11	277	4.3	
2005	No surveys Due to High Water				
2006	No surveys Due to High Water				
2007	66	20	425	0.30	6.44
2008	17.80	0	60	0.00	3.37
2009	72.30	9	413	0.12	5.71
2010	22.50	0	91	0.00	4.04
2011	47.90	3	197	0.06	4.11
2012	57.90	0	396	0.00	6.84
2013	65.90	0	341	0.00	5.17
2014	65.45	5	408	0.08	6.23
2015	58.85	0	290	0.00	4.93
2016	71.74	0	266	0.00	3.71
2017	49.49	0	154	0.00	3.11

Year	Miles Surveyed	# of Fish	# of Redds	Fish/Mile	Redds/Mile
2018	63.90	0	103	0.00	1.61

a/ Starting in 2000, redd counts were conducted generally later in the season and timed to capture peak count. Succeeding years utilized the same methodology.

Attachment 11:

Table 2.2.3a. Summer steelhead broodstock use and holding mortality at RBH, by BY

Brood Year	Wild Females		Wild Males		Hatchery Females		Hatchery Males	
	Spawned	Holding Mortality	Spawned	Holding Mortality	Spawned	Holding Mortality	Spawned	Holding Mortality
1990	37	4	35	7	156	16	156	14
1991	27	2	11	4	128	14	128	9
1992	18	6	18	9	127	17	127	8
1993	18	5	2	9	143	27	109	11
1994	24	3	50 a/	6	97	1	71 a/	3
1995	5	1	5	0	234	26	185	27
1996	10	3	6	2	136	37	133	47
1997	11	3	15	1	135	19	113	27
1998	7	3	12	2	159	15	170	7
1999	1	2	1	0	119	45	110	33
2000	2	4	2	2	145	20	143	19
2001	0	0	0	0	134	7	134	3
2002	0	0	0	0	144	33	144	35
2003	0	0	0	0	143	47	143	50
2004	0	0	0	0	195	49	187	66
2005	0	0	0	0	159	83	159	100
2006	0	0	0	0	117	98	117	90
2007	0	0	0	0	235	111	235	203

Brood Year	Wild Females		Wild Males		Hatchery Females		Hatchery Males	
	Spawned	Holding Mortality	Spawned	Holding Mortality	Spawned	Holding Mortality	Spawned	Holding Mortality
2008	0	0	0	0	362	218	362	154
2009	0	0	0	0	587	103	570	143
2010	0	0	0	0	N/A	N/A	N/A	N/A
2011	0	0	0	0	N/A	N/A	N/A	N/A
2012	0	0	0	0	N/A	N/A	N/A	N/A
2013	0	0	0	0	522	44	478	82
2014	0	0	0	0	385	26	385	24
2015	0	0	0	0	514	10	514	15
2016	0	0	0	0	501	47	485	15

a/ Some males were spawned twice due shortages in males available.

Attachment 12:

Table 2.2.3b. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Deschutes summer steelhead (natural origin); ESU/Population: Mid-Columbia				
Activity: Adult Trap Operation				
Location of hatchery activity: Deschute River Round Butte Hatchery; Dates of activity: Jan 1 to Dec 30; Hatchery program operator: ODFW.				
	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			400	
Capture, handle, tag/mark/tissue sample, and release d)			300	
Removal (e.g. broodstock) e)			100	
Intentional lethal take f)				
Unintentional lethal take g)			15	
Other Take (specify) h)				

Table 2.2.3c. Estimated salmonid take levels of by hatchery activity.

Listed species affected: Deschutes summer steelhead (<u>hatchery origin</u>); ESU/Population: Mid-Columbia				
Activity: Adult Trap Operation				
Location of hatchery activity: Deschutes River Round Butte Hatchery; Dates of activity: Jan 1 to Dec 30; Hatchery program operator: ODFW.				
	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			6800	
Capture, handle, tag/mark/tissue sample, and release d)			5600	
Removal (e.g. broodstock) e)			280	
Intentional lethal take f)				
Unintentional lethal take g)			60	
Other Take (specify) h)				

- a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
- b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
- c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
- d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
- e. Listed fish removed from the wild and collected for use as broodstock.
- f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
- g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
- h. Other takes not identified above as a category.

Attachment 13:

Table 3.3. Estimated harvest of RBH origin summer steelhead by sport and tribal fishers in the lower 100 miles of the Deschutes, by run year.

Run Year	Below Sherars Harvest	Above Sherars Harvest	Total RBH Harvest
1990	716	368	1,084
1991	316	402	718
1992	251	877	1,128
1993	196	675	871
1994	198	591	789
1995	270	937	1,207
1996	857	532	1,389
1997	552	435	987
1998	292	395	687
1999	485	1186	1,671
2000	702	872	1,574
2001	1067	665 a/	1,732
2002	1333	453 a/	1,786
2003	308b/	452	760
2004	192b/	380	572
2005	642b/	621	1,263
2006	749b/	306	1,055

Run Year	Below Sherars Harvest	Above Sherars Harvest	Total RBH Harvest
2007	1099b/	544	1,643
2008	2077	626	2,703
2009	3724	1474	5,198
2010	2368	562	2,930
2011	2517	456	2,973
2012	2001	260	2,261
2013	1281	225	1,506
2014	1999	427	2,426
2015	1125	680	1,805
2016	766	340	1,106
2017	394	206	600
2018	599	-	-

a/ Punch card catch not available. Estimated from long term percent of RBH catch above Sherars.

b/ Round Butte Below Sherars Harvest = (Total steelhead estimated) x (percent RB sampled in creel)

Attachment 14:

Table 6.2.2. Numbers of naturally produced and hatchery produced summer steelhead collected at the Pelton Trap for broodstock at RBH, 1990 – 2016 brood years.

Brood Year	Wild Males	Wild Females	Hatchery Males	Hatchery Females	Total
1990	35	38	277	212	562
1991	15	38	191	234	478
1992	29	39	140	161	369
1993	31	53	139	241	464
1994	30	51	54	99	234
1995	16	6	266	262	550
1996	13	26	252	275	556
1997	21	36	258	243	558
1998	17	29	304	310	660
1999	6	12	205	217	440
2000	8	12	219	204	443
2001	0	0	166	180	346
2002	0	0	219	226	445
2003	0	0	252	254	506
2004	0	0	253	244	497
2005	0	0	259	242	501
2006	0	0	207	215	422
2007a/	0	0	438	473	911
2008a/	0	0	516	580	1096
2009a/	0	0	713	690	1403
2010/a	0	0	653	676	1329
2011/a	0	0	673	754	1427
2012/a	0	0	649	750	1399
2013/a	0	0	570	638	1208
2014/a	0	0	575	570	1145
2015/a	0	0	562	562	1124
2016/a	0	0	514	567	1081

a/ Additional fish taken for Reintroduction program.

Attachment 15:

Table 6.2.3. Numbers of naturally produced and hatchery produced summer steelhead used in RBH brood, 1990 – 2016.

Brood Year	Wild Males	Wild Females	Hatchery Males	Hatchery Females	% Wild	% Hatchery
1990	35	37	156	156	19	81
1991	11	27	128	128	13	87
1992	18	18	127	127	12	88
1993	2	18	109	143	7	93
1994	50 a/	24	71 a/	97	31	69
1995	5	5	185	234	4	96
1996	6	10	133	136	6	94
1997	15	11	113	135	9	91
1998	12	7	170	159	5	95
1999	1	1	110	119	1	99
2000	2	2	143	145	1	99
2001	0	0	134	134	0	100
2002	0	0	144	144	0	100
2003	0	0	143	143	0	100
2004	0	0	187	195	0	100
2005	0	0	159	159	0	100
2006	0	0	117	117	0	100
2007b/	0	0	235	235	0	100
2008	0	0	362	362	0	100
2009	0	0	570	587	0	100
2010	0	0	N/A	N/A	0	100
2011	0	0	N/A	N/A	0	100
2012	0	0	N/A	N/A	0	100
2013	0	0	522	478	0	100

Brood Year	Wild Males	Wild Females	Hatchery Males	Hatchery Females	% Wild	% Hatchery
2014	0	0	385	385	0	100
2015	0	0	514	514	0	100
2016	0	0	501	485	0	100

a/ Represents some males that were spawned twice due to shortages.

b/ Beginning of additional fish taken for Reintroduction program.

Attachment 16:

Table 4.1. Analysis of water supplying Round Butte Hatchery (from Nyara 1989).

Analysis	West Bank Spring			Brood Spring			Raceway		
	Units	Results	Date	Units	Results	Date	Units	Results	Date
Dissolved Gas		106.6	5/24/1976		100.9	5/24/1976		105.2	5/24/1976
Total alkalinity	mg/l	67	7/22/1986	mg/l	70	7/22/1986	ppm		Unavailable
hardness	mg/l	45.9	7/22/1986	mg/l	349.7	7/22/1986			
PH		7.7	7/22/1986		7.8	7/22/1986		7.95	Unavailable
Cadmium	ppm	<0.002	7/22/1986	ppm	<0.002	7/22/1986			
Copper	ppm	<0.002	7/22/1986	ppm	<0.002	7/22/1986	ppm	0.001	Unavailable
Zinc	ppm	<0.002	7/22/1986	ppm	<0.002	7/22/1986			
Arsenic	ppm	<0.001	7/22/1986	mg/l	<0.001	7/22/1986			
CO2	mg/l	5.1	7/22/1986	mg/l	2.9	7/22/1986			
Ammonia	Mg N/l	<0.1	7/22/1986	mg N/l	<0.1	7/22/1986			
Turbidity				FTU	0.26	3/31/1975			
Total solids	ppm	96	unavailable			3/31/1975	ppm	100	Unavailable
volitile solids	ppm	0	unavailable			3/31/1975	ppm	0	Unavailable
Sodium	ppm	13.6	unavailable	mg/l	12	3/31/1975	ppm	12.2	Unavailable
Silicon	ppm	5.3	unavailable	mg/l	10.9	3/31/1975	ppm	5.6	Unavailable
Magnesium	ppm	3.8	unavailable	mg/l	6	3/31/1975	ppm	3.8	Unavailable
Potassium	ppm	9	unavailable	mg/l	7	3/31/1975	ppm	8.9	Unavailable
Calcium	ppm	0.6	unavailable	mg/l	8.4	3/31/1975	ppm	0.6	Unavailable
Aluminum	ppm	0.2	unavailable				ppm	0.1	Unavailable
Iron	ppm	0.06	unavailable	mg/l	<0.1	3/31/1975	ppm	0.08	Unavailable

	West Bank Spring			Brood Spring			Raceway		
Analysis	Units	Results	Date	Units	Results	Date	Units	Results	Date
lead	ppm	0.01	unavailable	mg/l	<0.1	3/31/1975	ppm	0.01	Unavailable
Barium	ppm	0.01	unavailable					0.01	Unavailable
Boron	ppm	0.006	unavailable				ppm	0.006	Unavailable
Vanadium	ppm	0.003	unavailable				ppm	0.004	Unavailable
Silver	ppm	0.001	unavailable				ppm	0.001	Unavailable
Chromium				mg/l	<0.1	3/31/1975			
Sulfate				mg/l	1	3/31/1975			
Chloride				mg/l	0.32	3/31/1975			
Chlorophyll a				mg/l	0.11	3/31/1975			
Chlorophyll b				mg/l	0.42	3/31/1975			
Chlorophyll c				mg/l		3/31/1975			

Attachment 17:

Table 9.1.1. Summer steelhead survival rates at RBH by brood year and life stage.

		Survival to Life Stage/Time Frame			Release
		Hatch-April (shock loss)	Loss up to Ponding	Loss of ponding to raceways	
Brood Year	Number of Eggs Taken	Eggs	Fry	Fingerling	Smolts
1988	695,419	69.9%	72.7%	91.3%	99.9%
1989	830,220	83.5%	53.6%	97.5%	99.9%
1990	903,002	92.3%	51.7%	93.5%	99.5%
1991	972,786	89.9%	92.3%	97.7%	99.0%
1992	716,277	84.4%	83.9%	98.1%	99.0%
1993	661,007	86.2%	96.4%	98.4%	99.9%
1994	667,292	91.5%	90.8%	44.5%	99.9%
1995	525,108	84.9%	90.9%	89.6%	99.9%
1996	717,000	86.6%	90.0%	95.5%	99.8%
1997	639,000	88.5%	77.1%	96.4%	99.9%
1998	711,330	85.9%	94.7%	99.1%	99.8%
1999	764,592	90.7%	94.7%	96.3%	99.8%
2000	648,646	87.6%	98.6%	95.3%	99.8%
2001	629,684	73.4%	95.1%	87.0%	88.9%
2002	771,084	83.4%	93.3%	96.8%	98.1%
2003a/	837,309	81.9%	95.4%	76.9%	92.3%
2004a/	813,750	78.9%	95.3%	78.2%	97.9%
2005a/	732,328	80.1%	92.5%	85.5%	89.8%
2006	592,298	86.3%	92.8%	94.5%	97.7%
2007b/	1,242,135	93.9%	95.6%	97.7%	92.1%
2008	1,834,127	91.7%	95.6%	92.1%	89.7%
2009	3,488,207	90.8%	93.3%	97.2%	N/A

a/ High losses due to IHN

b/ Beginning of reintroduction program

Table 9.1.2. Summer steelhead survival rates at WFH by brood year and life stage.

Brood Year	Eyed Eggs Received	Eggs to Fry	Fry to Fingerlings	Fingerlings to Smolts
2015	56,000	100%	96.0%	100.0%
2016	56,000	92.4%	96.2%	99.9%
2017	56,000	96.0%	98.8%	98.5%
2018	64,000	98.5%	85.2%	100.0%

Attachment 18:

Table 15.3. Capture records for bull trout sampled at the Pelton Trap, by run year.

Year	Month Captured	Number Captured
1992		0
1993	Jun, Jul	5
1994	Aug	2
1995		0
1996	Jun	2
1997	Jan, Jun, Jul, Aug	17
1998	Jun, Jul, Aug	12
1999		0
2000	Jun, Jul, Aug	8
2001	May, Jun, Jul, Sep, Nov	10
2002	Jun, Jul, Aug	9
2003	Feb, Nov	2
2004	Feb, Jul, Aug, Sept, Nov, Dec	10
2005	Jun, Jul, Aug, Nov	15
2006	Jan, Feb, May, Jun, Jul, Aug, Sept, Oct	15
2007	Jun, Jul	5
2008	Mar, Jun, Aug, Nov, Dec	11
2009		32
2010		29
2011		14
2012		51
2013		109
2014		14
2015		32
2016		13

Attachment 19:

Deschutes River wild Summer Steelhead Run Size Prediction Model and Associated Maximum Brood Take Numbers.

Working Principles:

- 1) No wild fish will be collected for broodstock until this HGMP has been approved by NOAA Fisheries.
- 2) All wild fish collected for broodstock will be collected from the Pelton Trap.
- 3) Run size predictor based on in-season data is less complicated, less variable, and functionally accurate enough to fulfill needs of HGMP.
- 4) Steelhead are not captured at Pelton Trap before the first week of September; using Sherars trap data summarized through August 31st gives the first good opportunity to forecast run size prior to the first fish arriving at Pelton.
- 5) Although the Recovery Plan differentiates between Deschutes River Eastside and Westside populations and sets recovery goals for each separate population (Carmichael and Taylor 2010), recent genetic work found no statistically significant genetic differences between these previously delineated populations (Hawkins et al. 2011). As a result, modeled run size predictions and broodstock collection limits are based on the total Deschutes River wild summer steelhead run.
- 6) At predicted wild Deschutes River steelhead run sizes < 2,500 fish, no wild fish will be collected for broodstock. The 2,500 fish floor for broodstock collection is a conservative value based on the sum of the minimum abundance thresholds for the Eastside and Westside populations identified in the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Carmichael and Taylor 2010).
- 7) At predicted wild steelhead run sizes \geq 2,500 fish, broodstock will be collected at a 4% of the predicted run size. Collection targets will be based on forecasted return levels and additional analyses regarding wild fish impacts and hatchery program needs.
- 8) Maximum broodstock collected will not exceed the 100-fish limit proposed in the HGMP.
- 9) If the 3-year rolling average of the percentage of the Deschutes-origin wild steelhead run collected for broodstock equals or exceeds 4%, no wild Deschutes origin steelhead will be collected until that average falls below 4%.
- 10) If new information or unforeseen circumstance dictate, brood collection and/or associated protocol will be adjusted or curtailed as deemed prudent.

Deschutes River Wild Summer Steelhead Run Size Prediction Model

- 1) The initial approach to predicting Deschutes River wild summer steelhead run size will be based on Sherars Falls trap catches of wild (designated WSTS) and Round Butte Hatchery (designated RBSTS) fish captured by August 31st and September 30th. The August 31st run prediction will be used to determine whether or not broodstock collection should begin at Pelton trap, while the more accurate September 30th prediction will refine broodstock collection numbers. We will continue to evaluate the forecast model and modify it as new information becomes available.
- 2) August 31st run prediction model is:

$$\text{Number of wild steelhead} = 2663 + (90.92 * \text{WSTS}) - (17.84 * \text{RBSTS})$$

$$\text{Multiple R} = 0.776, R^2 = 0.603$$
- 3) September 30th run prediction model is:

$$\text{Number of wild steelhead} = 1697 + (14.53 * \text{WSTS}) - (1.19 * \text{RBSTS})$$

$$\text{Multiple R} = 0.869, R^2 = 0.756$$
- 4) August 31st run prediction model is:

$$\text{Number of wild steelhead} = 121.9 + (9.63 * \text{WSTS}) - (0.062 * \text{RBSTS})$$

$$\text{Multiple R} = 0.924, R^2 = 0.854$$
- 5) September 30th run prediction model is:

$$\text{Number of wild steelhead} = 51.9 + (1.449 * \text{WSTS}) + (0.048 * \text{RBSTS})$$

$$\text{Multiple R} = 0.976, R^2 = 0.953$$

Summary:

Modeled broodstock collection for 2000-15 limited by Working Principles 4-8 (outlined above) and based on the concept that the total Deschutes origin wild summer steelhead run comprises one population.

	Final end of season Run estimate ¹	Aug 31st Run size Prediction ²	Brood Collected ³	% of Final run Estimate ⁴	Sep 30th Run size Prediction ⁵	Brood Collected ⁶	% of Final run Estimate ⁷
2000	8985	8779	100	1.11	9447	100	1.11
2001	8749	7299	100	1.14	8209	100	1.14
2002	9363	6356	100	1.07	7095	100	1.07
2003	5524	3801	76	1.38	4913	98	1.77
2004	3161	3039	30	0.95	3506	70	2.21
2005	3432	4311	86	2.51	3082	30	0.87
2006	3986	4345	86	2.16	3957	79	1.98
2007	3482	3909	78	2.24	3980	79	2.27
2008	4048	4775	95	2.35	4359	87	2.15
2009	4236	6361	100	2.36	6715	100	2.36

	Final end of season Run estimate ¹	Aug 31st Run size Prediction ²	Brood Collected ³	% of Final run Estimate ⁴	Sep 30th Run size Prediction ⁵	Brood Collected ⁶	% of Final run Estimate ⁷
2010	7257	8595	100	1.38	7691	100	1.38
2011	5450	5112	100	1.83	4805	96	1.76
2012	3749	4073	81	2.16	3756	75	2.00
2013	5450	4583	91	1.67	4498	89	1.63
2014	5358	4627	92	1.72	4558	91	1.70
2015	2457	4713	94	3.83	4107	82	3.34

¹ ODFW end-of-season Deschutes River StS run estimate.

² Predicted run size based on Aug 31st Sherars trap total using multiple regression model.

³ Number of brood that would have been taken if proposed brood limits had been in effect.

⁴ Percentage of the total end-of-season run that brood number would have comprised.

⁵ Predicted run size based on Sep 30th Sherars trap total using multiple regression model.

⁶ Number of brood that would have been taken if proposed brood limits had been in effect.

⁷ Percentage of the total end-of-season run that brood number would have comprised.

Ancillary information, in addition to the forecasts described above, may be considered in any year to help determine whether or not to take wild fish for broodstock. This would primarily be done to maximize the potential that the actual take of wild summer steelhead for broodstock would not exceed the limits identified above.

Recommendation: Use August 30 Sherars Falls trap counts for wild and hatchery StS adults to predict if and at what level wild steelhead adults can be collected at the Pelton trap for broodstock at Round Butte Hatchery. Use September 30 Sherars Falls trap counts for wild and RBH StS adults to further refine broodstock collection numbers at Pelton trap.

LITERATURE CITED

Carmichael, R. W. and B. J. Taylor. 2010. Conservation and Recovery Plan for Oregon Steelhead

Populations in the Middle Columbia River Steelhead Distinct Population Segment.

Hawkins, D. K., K. S. Williamson, A. P. Matala, D. Hand, D. Olson, and H. Schaller. 2011.

Population structure and genetic characteristics of summer steelhead (Oncorhynchus

mykiss) in the Deschutes River Basin, Oregon. United States Fish & Wildlife Service Abernathy Fish Technology Center Final Report.

Supplement to Attachment 19 (per conversation with Rich Turner 8/21 & 29/2017)

Goal is to collect up to 100 natural origin Deschutes River StS annually at Pelton Trap but no more than 4% of the 3-year rolling average of the final end-of-season run estimate.

First priority for natural origin females is for smolt production in support of reintroduction.

Any natural origin fish in excess of smolt production needs, up to the 2% cap or 100 fish, whichever is less, will be integrated into or substituted for Round Butte Hatchery broodstock in a manner to maximize the genetic contribution or benefit of the wild fish.

APPENDIX 1. Proposed Action Plan

Round Butte Summer Steelhead

The Pelton-Round Butte Project was constructed in the 1950s and 1960s with fish passage facilities; however, the facilities were not successful in providing for the downstream migration of juvenile anadromous fish and fish passage was abandoned in 1968. Mitigation for lost habitat and salmon and steelhead production mandated that both summer steelhead and spring Chinook salmon smolts be reared and released from Round Butte Hatchery into the Deschutes River below the Pelton Regulating Dam (RM 100.1) (Figure 1).

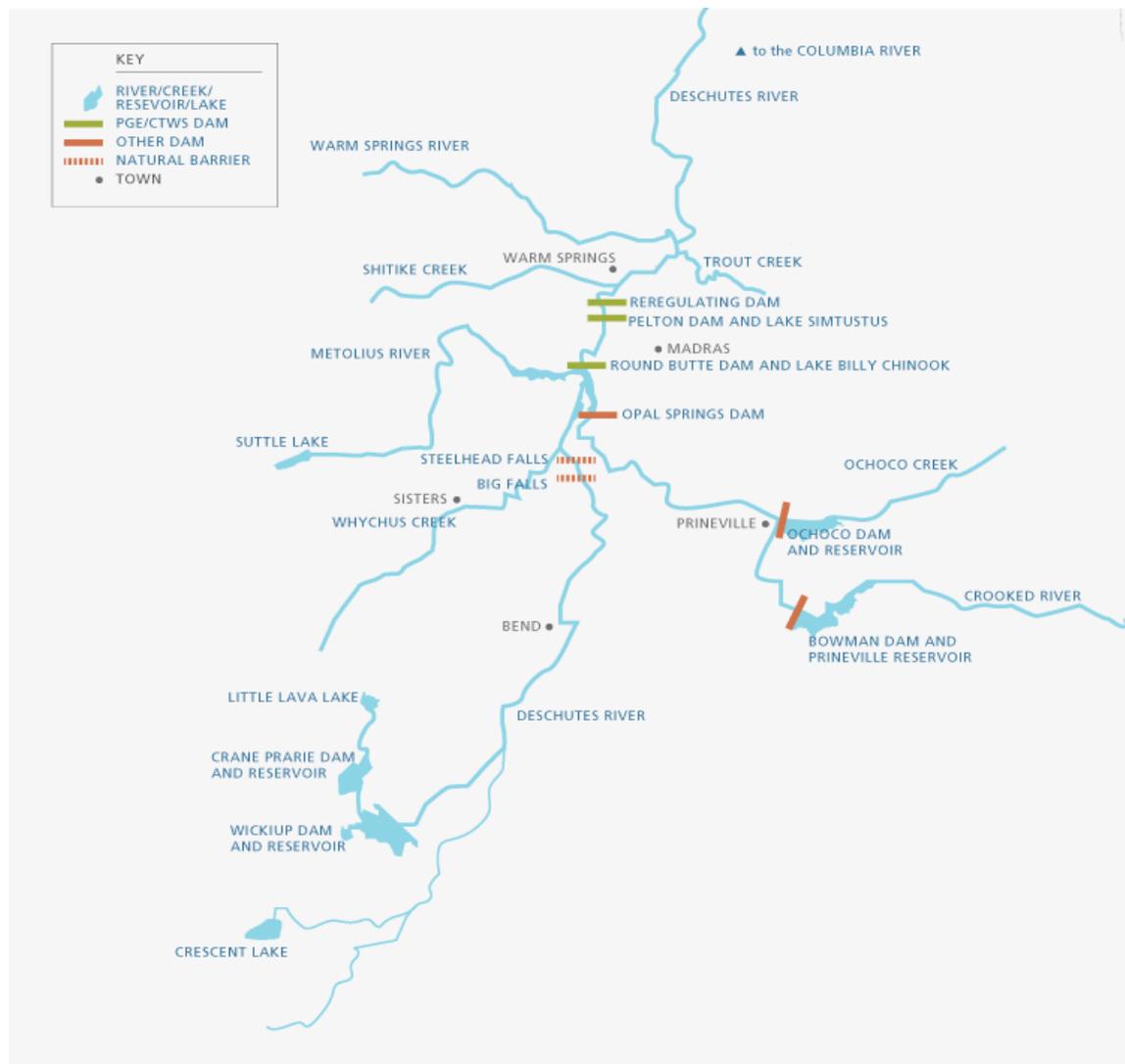


Figure 1. Map of the Deschutes River Basin (from Hawkins et al. (2011)).

The RBH summer steelhead program produces hatchery summer steelhead for three functions (Table 1): (1) an isolated harvest program that releases 162,000 smolts into the lower Deschutes River below the Pelton Ladder for mitigation; (2) a resident trout program that releases 30,000 summer steelhead juveniles (@ 2 fpp) into Lake Simtustus; and (3) produce juveniles to support reintroduction efforts above Round Butte Dam. Reintroduction releases will include up to 100,000 smolts. A group of 10,000 smolts will be acclimated at the Opal Springs Hatchery and then transported and released below the Pelton Dam to increase adult returns for reintroduction. Smolt releases will also support the evaluation of the downstream juvenile fish collection facility.

1. Table 1. Round Butte Hatchery summer steelhead program functions, release location, release number, and size at release. Note that reintroduction releases locations may be expanded to include other tributaries above Round Butte Dam in the future.

Function	Release Location	Number Released	Size at release (fpp)
Anadromous			
	Below Pelton Trap	162,000	4
Resident			
	Lake Simtustus	30,000	2
Reintroduction			
	Whychus Creek	50,000	5
	Crooked River	40,000	5
	Below Pelton Dam (Opal Springs Acclimation)	10,000	5
	Total	100,000	

To annually provide for the all of the program releases listed above an estimated 280 adults (50% female are needed for broodstock. Out of the 280 adults, the program goal is

to include up to 100 NOR adults in the broodstock. Adults enter the Deschutes River from August through April. Adults are collected at the Pelton Ladder trap and transported to RBH. Broodstock is separated into three groups for spawning: Group 1 is collected from October to December; Group 2 from December and January; and Group 3 from February to March. Spawning of Groups 1 and 2 takes place in January and Group 3 in February and March. Similar to the spring Chinook salmon program, surplus hatchery adults will be provided to the CTWS or food share programs, all fish not fit for human consumption will be landfilled.

The HGMP provides a detailed history of the broodstock used at RBH. Natural-origin summer steelhead collected at the Pelton Ladder trap were used as part of the broodstock from 1988 to 1992 and spawned separately from returning hatchery adults. Difficulty spawning and rearing the natural-origin adults limited the crosses to less than a 1/3 of the production. From 1993 to 1995, natural-origin adults were used in matrix crosses with returning hatchery adults. Natural-origin adults for broodstock ended in the 1997-98 return year due to increased evidence of out-of-basin strays entering the Deschutes River and concerns with the introduction of whirling disease into the RBH broodstock. Since that period only known RBH adults (identified with unique fin marks) have been used for broodstock. The number adults used for broodstock increased in 2007 to support the reintroduction program.

Recent increases in ODFW's understanding of whirling disease and how to eliminate transmission through hatchery broodstock as well as recent advances in the ability to identify the origin of unmarked steelhead has led to ODFW to propose to once again incorporate natural-origin adults into the broodstock. ODFW is proposing to take up to 100 natural-origin adults (50% female) to incorporate into the broodstock for the reintroduction program and for establishment of a new broodstock for the mitigation release (Table 2). Attachment 19 of the HGMP describes how many natural-origin broodstock could be collected annually based on an in river run size prediction model so as not to exceed the 4% limit of the estimated return of NOR steelhead to the Deschutes River. This would be based on a moving three-year average, as measured at Sherars Falls.

Given an anticipated maximum capture of 400 natural-origin steelhead at the Pelton trap (based on maximum capture of 398 in the last 30 years, (Table 3), up to 300 fish would be handled, tagged, and released back into the Deschutes River below the trap, while a maximum of 100 fish would be transferred to RBH to be held, live spawned, and released.

Table 2. Maximum number of natural-origin adult steelhead and juvenile *O. mykiss* expected to be encountered, sampled, and tagged, and anticipated mortality during broodstock collection activities in the Deschutes River Basin.

Activity	Adult Steelhead			
	Encountered	Sampled	Retained for Broodstock	Mortality
Pelton Dam Adult trapping				
Broodstock	400	300	100	15

Selected NOR adults will receive a coarse genetic test (e.g. PBT) to determine that they are not of hatchery origin prior to being included in the broodstock.

For those natural-origin adults collected for broodstock, the priority for the first 20 NOR females (and 20 NOR males) will be to produce eggs for the reintroduction smolt program (64,000 eyed eggs that would be reared at Wizard Falls). If survival is greater than expected, surplus fry from the NOR x NOR production will be released into the Upper Basin. All natural-origin broodstock utilized for these programs will be live-spawned in order to minimize the lethal take of these fish.

All remaining NOR adults, up to the 100 adults total, will be spawned together (NOR x NOR) to create a new broodstock that will be used to supplement the mitigation production (162,000 release at Pelton Trap.)

2. Table 3. Summer steelhead trapped at the Pelton adult trap and their final disposition.

Year	Total Trapped	Natural-origin released	Round Butte Hatchery Returns	Hatchery Retained for Broodstock	Surplus Hatchery	Stray out-of-basin Hatchery
2007	5,412	135	3,543	911	4,181	1,734
2008	4,090	178	3,109	1,096	2,509	803
2009	7,617	398	4,806	1,403	5,890	2,413
2010	4,326	215	3,130	1,329	2,684	981
2011	2,923	138	2,441	1,427	1,309	325
2012	2,353	158	1,888	1,399	1,034	287
2013	1,609	64	1,258	1,208	460	287
2014	3,140	174	2,576	1,145	1,728	390
2015	2,479	57	2,207	1,124	688	215
2016	2,316	38	2,068	1,239	484	175
2017	1,886	51	1,680	118	283	158

The proposal to use the first 40 NOR adults for the reintroduction program for a release of approximately 50,000 smolts, which is less than the long term goal 100,000 full-term smolts at 5 fish per pound. Under the long-term reintroduction goal, 40,000 smolts would be released into the Crooked River and 50,000 into Whychus Creek from mid-April through early May. By doing this in the short-term it will allow for the rapid integration of the mitigation production with the expectations of reducing impacts on the natural-origin populations below Pelton Dam from naturally spawning hatchery steelhead. The remaining 10,000 smolts will be acclimated at the Opal Springs Hatchery and then transported and released below the Pelton Dam to increase adult returns to basin. In the short-term, the 50,000 smolts would be divided into three groups, 20,000 released into Whychus Creek, 20,000 into the Crook River, and 10,000 acclimated at Opal Springs.

The Deschutes Valley Water District (DVWD) owns and operates the Opal Springs Hatchery and will acclimate and release a separate group 6,000 smolts at Opal Springs as mitigation for the operation of the Opal Springs Hydropower facility. This group will use Round Butte hatchery adults for brood and will not be part of the integrated production.

NOR and HOR fish will be spawned and reared separately until marking, where after marking they will be mixed.

All returning F1 NOR reintroduction adults, identified by fin-clip and blank wire tags, will be passed above the hydro facility and allowed to spawn naturally. Returning F1 integrated RBH mitigation adults, identified by fin-clip and blank wire tags, will be integrated with returning NOR fish collected from the Pelton Trap to produce as much of the 162,000 smolts as possible. In subsequent years after the initiation of NOR broodstock collection, HOR x HOR fish will be used to backfill production to meet production of 162,000. The establishment of the new broodstock of NOR fish will occur at the maximum rate of up to 30 females, until the HOR RBH is no longer needed to meet production

Following conversion to the new broodstock and phasing out of the existing HOR broodstock, the goal will be to have the proportion of wild NOR fish in the broodstock equal to twice the expected pHOS (based on a 3-year running average), but not to exceed 4% of the estimated NOR summer steelhead return to the Deschutes River. The goal of the program will be to have a PNI for the program of 0.67, or greater, while taking no more than 4% of the NOR population for broodstock.

The reintroduction NOR smolt program will be scaled back as natural production of returning adults begins seeding tributary habitats. Once natural production by returning adults becomes self-sustaining, the smolt program will be terminated. Similarly, if the Pelton Round Butte Fish Committee (PRBFC) determines the reintroduction effort is unsuccessful and alternative mitigation is agreed upon, the reintroduction program will be

discontinued. The PRBFC is a group of agency and stakeholder representatives which provide oversight and guidance to the Co licensees of the Pelton Round Butte Hydroelectric Project. Notwithstanding individual member's statutory authorities, the group is authorized through the FERC license to make recommendations and decisions consistent with the terms and conditions of the Settlement Agreement including the Anadromous Fish Reintroduction Plan.

Steelhead will be reared at the RBH to a size of 4 fpp and directly released into the Deschutes River near the Pelton Ladder in early April. All of the 162,000 smolts released below Pelton Dam are double fin-clipped utilizing an adipose fin-clipped and an alternating right or left maxillary. Those fish released into Lake Simtustus are given an adipose fin-clip and a right pectoral fin-clip. Following integration of first generation progeny of NOR x NOR crosses for RBH hatchery stock in the downriver production program, the F1 fish will be differentially marked with a blank wire tag to distinguish them from other RBH stocks.

RBH is located 15 miles upstream from the Pelton trap (Figure 1). RBH receives its water from the west bank grout tunnel drilled into the canyon wall immediately west of the hatchery. The hatchery is located on the powerhouse deck at Round Butte Dam. When the dam was being constructed during the early 1960s, tunnels were drilled into the basalt canyon walls at several elevations on each side of the dam site. Liquid grout was pumped into the tunnels and used to fill cracks in the basalt in an attempt to minimize seepage through the rock on either side of the dam. After Lake Billy Chinook filled in 1964, some delayed seepage did find its way through the cracks in the basalt and was captured in the lower tunnels that open above the powerhouse on each side. When the hatchery was sited, it was the presence of the delayed seepage water on the west bank that was the factor for determining the location. Although this is seepage water, it travels through enough rock that it emerges at about 50°F year around. Approximately two weeks after there is turbidity in the tailrace from run-off out of the Crooked River basin, the hatchery water becomes slightly off-color. This indicates a mean seepage delay time of at least that long.

Since hatchery water is not withdrawn from a live stream but rather is derived from the west bank grout tunnel drilled into the canyon wall immediately west of the hatchery, there is no possibility of effect on listed fishes from hatchery water withdrawal. Round Butte Hatchery has two water right permits for fish rearing purpose (Permit #37974 for 20.0 cfs, and Permit #52642 for 0.27 cfs). The source of the water rights is the Round Butte Reservoir, and the facility complies with the limits.

Also, the Pelton Ladder has a water right permit (Permit #32372) for withdrawing 13.30 cfs water from the Deschutes River, and complies with the withdrawal limit. Both facilities (Round Butte Hatchery and Pelton Ladder) are operated under the NPDES General Permits 300-J (EPA File #ORG13700-6 and #ORG13701-4, respectively) issued to PGE. The PGE staff monitor and report the effluents' water quality data quarterly to the Oregon Department of Environmental Quality (DEQ) to comply with the water quality standards and limits. Meeting these legal standards should minimize the potential take of listed species.

Wizard Falls Hatchery is located on the Metolius River, a tributary to Lake Billy Chinook. This facility is located at (44° 31' 24" N and 121° 37' 56.14" W) (Figure 1). The hatchery was constructed in 1947 and the water is currently supplied from two sets of springs. Water rights for both springs combined is 13.5 CFS. When the hatchery went into operation the West Bank Spring (WBS) was only available until 1989 when East Bank Spring (EBS) became operational. The WBS provides 10 CFS of water at 50°F all year round and is located on the West side of the river about 1/8 mile upstream of the hatchery. The WBS comes out of the ground and travels approximately 200 yards before entering the intake. EBS provides 2.5 CFS of 44°F water year round and is located on the East side of the river and is about 1/2 mile upstream. The EBS comes out of the ground and immediately into a capped spring box and enters the intake. WBS water quality is good with clean oxygenated water, but does have some low level parasites. EBS water quality is excellent with clean, oxygenated and pathogen free water. Starting in 2012 and ending in 2017 the hatchery underwent three modification improvement phases. The old

circular and oval ponds were decommissioned and new starter ponds and intermediate rearing ponds were built. By doing this the hatchery gained the option of reusing the water a second time on the lower ponds. The reuse water is used to rear older age classes of fish that are more tolerant of degraded water quality.

The Whychus Acclimation Facility will be located on Whychus Creek in the Camp Polk area (44° 19' 27.82" N and 120° 30' 15.23" W) (Figure 1). The Whychus Creek Acclimation Facility will use a 120' long by 12' wide by 4.9' high Modutank structure with a polyurethane liner, in which water will be pumped from the creek using a 5 horsepower irrigation pump with state and federal mandated pump screens in the creek. The water will be pumped through the tank at an approximate rate of 600-800 cfs. The outflow of the pond will be in the same approximate location as the inflow so no water will be loss to the stream and will have minimal impacts. The water will be utilized through an ODFW Salmon Trout Enhancement Program (STEP) water right exemption. The acclimation facility will be operational from March through the middle of May and staff, as well as, volunteers will be on-site to inspect the facility and feed fish during the acclimation period. If power is lost on-site a backup generator will wired to automatically power on and air stones will be placed on the bottom of the tank to increase dissolved oxygen if power is lost for a period of time. Groups of smolts will be acclimated for approximately 3 weeks beginning the third week of March and continuing through last full week of May.

In the Crooked River, acclimation will occur at the mouth Ochoco Creek, downstream of Ochoco Dam, approximately .13 miles upstream from where it enters the Crooked River (44° 14' 24" N and 120° 53' 25.09" W) (Figure 1). Four live cars will be placed in the stream and are approximately 10 feet long, 6 feet wide and 4 feet deep. The live cars have a ¼ wire mesh around the cage and have opening in the back of the live car so that it can be pulled and the fish can be released volitionally. The live cars are placed in the water so that they are 3 quarters submerged in water. Approximately 2,000 to 2,500 smolts will be acclimated per live car for 8 to 10 days and then released. Individual release groups will be between 8,000 to 10,000 smolts, depending on water flow and depth in Ochoco Creek

at the time that the smolts are in the live cars. The landowner, the Deschutes Land Trust, plans to restore the property and restoration plans are currently being finalized. The proposed restoration plans for the site include an acclimation site, either a pond with a release gate or a side channel with screening. Design plans will be finalized and restoration is slated to begin on or before 2025, if necessary funding is found. Until the restoration is complete, acclimation will continue to occur in live cars in Ochoco Creek or until another option is deemed more applicable.

Opal Springs hatchery, located on the Crooked River downstream of the Opal Springs Dam, at RKM 336 (Figure 1). The facility is small hatchery that is owned and operated by Deschutes Valley Water District (DVWD). The hatchery raises approximately 6,000 steelhead smolts from RBH broodstock for mitigation purposes that are volitionally released into the Crooked River at the facility as part of the DVWD mitigation and in conjunction to bolster the Reintroduction efforts. Broodstock for Opal Springs mitigation program would not be supported by the proposed integration of wild broodstock and would utilize RBH broodstock that is intended for lower Deschutes mitigation releases. The Opal Springs Hatchery is operated in conjunction with the Opal Springs Hydropower facility, which is owned and operated by the DVWD. This facility uses water from both opal springs, a natural spring that produces a significant flow into the Crooked River, and Crooked River water depending on the time of year, water flow levels, and if mixing of the water is needed to facilitate acclimation purposes. The facility uses Opal Springs spring water coming is approximately 2.3 cfs and up to 0.5 cfs Crooked River water. The water that comes from Opal Springs is provided by head pressure from the spring themselves and the Crooked River water comes from the Penstock, which is screen so that no fish can enter or exit from that source. Once DVWD releases their mitigation smolts in early February, 10,000 reintroduction smolts at a time would then be transferred into the Opal Springs facility for acclimation purposes. A group of 10,000 smolts will be acclimated between 10 to 15 days and then transported and released below the Pelton Dam into the lower Deschutes River.

Under agreement with the CTWS, all adult steelhead in excess of broodstock needs are provided to the Tribe (CTWS Resolution No. 1935, January 20, 1961). Those in excess of tribal needs are offered to local food banks or food share organizations. Fish that are not up to the standard for human consumption, or carcasses from spawning, pond mortality, or culls are buried on Ivan Flat near the PGE Pelton-Round Butte Hydro Maintenance office.

Non-listed fall Chinook salmon are also handled and released during broodstock collection activities at the Pelton adult trap (Table 4). Since 2011, marked hatchery adults have been retained and provided to the tribe or local food banks, or placed in a landfill.

3. Table 4. Non-listed Fall Chinook Salmon collected at the Pelton adult trap and their final disposition.

Brood Year	Total Trapped	Natural-origin released	Hatchery origin released	Mortalities
2007	424	424	0	0
2008	422	422	0	0
2009	373	373	0	0
2010	690	690	0	0
2011	661	661	0	0
2012	2041	2041	0	0
2013	1548	1548	0	0
2014	1420	1420	0	0
2015	1381	1381	0	0
2016	779	779	0	0
2017	196	196	0	0

Non-listed spring Chinook salmon will also be collected at the Pelton adult trap. Spring Chinook salmon are retained for broodstock for the RBH Spring Chinook Salmon program and to support reintroduction efforts above Round Butte Dam (NMFS 2018a).

Table 5. Adult spring Chinook salmon trapped at the Pelton adult trap and their final disposition.

Brood Year	Total Trapped	Natural-origin released/mortalities	Retained for Broodstock	Surplus Hatchery	Released upstream (RM/LM)
2007	1,761	20/0	589	1,125	0
2008	1,604	29/0	843	207	0
2009	5,216	35/0	942	4,133	0
2010	2,087	66/0	739	1,216	0
2011	2,832	0/0	863	1,775	0
2012	1,335	24/0	798	537	24
2013	1,774	22/0	818	990	22
2014	559	24/0	371	155	24
2015	1,145	128/0	552	347	53
2016	827	39/0	524	118	54

Source: ODFW's HMS database

Monitoring and Evaluation Activities

Monitoring and Evaluation activities are occurring above Pelton Dam as part of the evaluation of the Selective Water Withdrawal juvenile collection facility above Round Butte Dam and to monitor the reintroduction efforts. These activities are currently covered under the biological opinion for the issuance of the FERC license (project 111 FERC ¶ 61450).

Sherars Falls Adult Sampling.

A sub sample of fish ascending the fish ladder at Sherars Falls (river mile 40) are captured and marked at the Sherars Falls adult trap from July 1 to October 31. When operated, the trap blocks passage at the uppermost pool of the fish ladder and diverts fish into a livebox. The trap is operated approximately 40 hours per week, at times believed be the peak of diurnal migration period. All fish captured in the trap are anesthetized with a carbon dioxide solution, identified by species and bio-sampled before released

upstream. Summer steelhead and fall Chinook are measured to the nearest 0.5 centimeter fork length, tagged with an individually numbered anchor tag, scales and genetic samples are removed.

Peterson mark recapture population estimates for the various components of the summer steelhead run passing Sherars Falls are made after the completion of the run year on May 31 of each year. Up to 1,000 NOR steelhead could be captured and tagged at the Sherars Trap annually from June through October, and released upstream from the trap. For the period from 2013-2017 there has only been one known NOR steelhead mortality during trapping operations at Sherars Falls. Subsequent capture events of both tagged and untagged fish are made at Round Butte Hatchery, Warm Springs National Hatchery, and Trout Creek Fish Trap. Stock composition is determined by fin marks.

4. Table 6. Number of unmarked summer steelhead captured at Sherars Falls Trap, by two week period.

Year	June	July		August		September		October		Total
	16-30	1-15	16-31	1-15	16-31	1-15	16-30	1-15	16-31	
2008			7	18	13	82	158	165	61	504
2009			4	19	56	231	283	247	124	964
2010		5	17	28	31	104	331	192	105	813
2011			11	13	13	62	160	178	63	500
2012		1	5	10	8	34	124	92	21	295
2013		2	6	12	10	70	113	76	54	343
2014		1	8	9	17	29	161	189	116	529
2015	1	6	6	18	23	52	118	107	45	376
2016	0	0	1	5	1	8	51	36	3	105

Fisheries are not part of this Proposed Action. Although tributary fisheries target hatchery-origin returns from this program, harvest frameworks are managed separately from hatchery production, and are not solely tied to production numbers. Additionally, production and fishery implementation are subject to different legal mandates and

agreements. Because of the complexities in annual management of the production and fishery plans, fisheries in these areas are considered a separate action (NMFS 2003).

There are also existing main-stem Columbia River and ocean fisheries that may catch fish from this program. However, these fisheries would exist with or without this program, and have previously been evaluated in a separate biological opinion (NMFS 2008c). The impacts of fisheries in the Action Area on these programs and, in particular, on ESA-listed salmonids returning to the Action Area for this opinion are included in the environmental baseline.