HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Species or Hatchery Program:	**Round Butte Hatchery Spring Chinook Program**
Hatchery Stock:	**Deschutes River Spring Chinook ODFW Stock 066**
Agency/Operator:	**Oregon Department of Fish & Wildlife**
Watershed & Region:	**Deschutes River Watershed High Desert Region**
Draft Submitted:	
Submitted for Consideration Under ESA Section 4(d):	**July 20, 2017**
Date Last Updated:	**July 20, 2017**

1. GENERAL PROGRAM DESCRIPTION

1.1. Name of hatchery or program.

Round Butte Hatchery (RBH), Deschutes River spring Chinook program (stock 066).

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

Spring Chinook salmon (*O. tshawytscha*) in the Deschutes River were reviewed for possible listing as part of the Mid Columbia ESU, but a ruling on March 9, 1998 found that listing was not warranted for this population (NMFS 1998). Summer/Fall Chinook salmon in the Deschutes River were reviewed for listing in 1999, and were ruled "Not Warranted," September 16, 1999 (NMFS 1999b).

1.3. Responsible organization and individuals.

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

Although the ODFW is responsible for operation of the facility, however, due to the hatchery location and funding responsibility, Portland General Electric (PGE) personnel are 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 Department of Branch of Natural Resources (CTWS-BNR) regarding operation of the Pelton Trap, and the hatchery trap for RBH. Under agreement with the CTWS, all fish in excess of broodstock are provided to the Tribes (CTWS Resolution No. 1935, January 20, 1961).

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

- Funding for this program is approximately 82 % from PGE and 16% 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, one six-month seasonal employee, and up to eleven seasonal fin clippers.

The annual budget does not discriminate between the three rearing programs at RBH. In FY2008, approximately 36% of the fish (by weight) reared at the hatchery are spring Chinook, 42% summer steelhead smolts for mitigation releases, and 22 % post-smolt steelhead for the Lake Simtustus put-and-take fishery and for the fry being utilized for the Reintroduction effort.

Annual Program Budget.

The annual program budget is displayed 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 Budget		Mitigation StS Component		Supplementation StS Component		PGE ChS Component		BPA ChS Component	
Jul 1 - Jun 30		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.

RBH is located on the powerhouse deck of Round Butte Dam on the Portland General Electric's Pelton Round Butte Project; and ODFW is responsible for operation of the facility. 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, at latitude 44° 43' 34" N and longitude 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 brood stock are transported from the Pelton Trap by truck approximately 15 miles to the holding ponds at RBH, located on the powerhouse deck immediately below Round Butte Dam (WRIA number 17070306.081). This facility sits 1,591ft above MSL at latitude 44° 36' 12" N and longitude 121° 16' 36" W. Round Butte Dam is the uppermost of the three-dam complex, and it impounds the Deschutes River at RM 111 forming Lake Billy Chinook. This reservoir also impounds the lower Metolius and Crooked rivers. The middle of the three dams is Pelton Dam at RM 103 which impounds Lake Simtustus, located downstream from Round Butte Dam and upstream from the Pelton Regulating Dam.

The Pelton Ladder, a 2.8 miles long,10 feet wide, 6 feet deep conventional pool and drop fish ladder, located on the east bank of the Deschutes was originally constructed to facilitate the movement of returning adult salmonids volitionally around the Regulation Reservoir and Lake Simtustus. From there, adult salmonids would swim upstream to Round Butte Dam and were moved over the dam by means of a trap and a tramway. The ladder was abandoned as an adult passage facility after it was agreed that fish survival through the hydroelectric project was not adequate to maintain naturally-produced anadromous runs.

While spring Chinook have been released from RBH since 1973, the Pelton Ladder has been used and evaluated as a rearing area since releases in 1977. Rearing juvenile spring Chinook in the Pelton Ladder has proven to be a unique and effective technique for increasing adult spring Chinook returns (Smith 1991). Smolts reared in the ladder have shown higher smolt-to-adult return rates than smolts reared in the hatchery environment (Smith 1991). For example, the average return rate for five brood years from 1977 to 1983 of spring Chinook (adults and jacks) reared in the ladder was 1.6% compared to 0.5% for those reared in Ponds (Lindsay et al. 1989). Spring Chinook reared in the ladder apparently benefit from the semi-natural rearing conditions and demonstrated better ability of volitional migration at the onset of smoltification.

CTWS-BNR cooperate with ODFW and PGE in the Pelton Ladder rearing program, a component of the larger Hood River Production Project (HRPP), an anadromous fish supplementation and habitat improvement project approved by the Northwest Power Planning Council (now the Northwest Power and Conservation Council) and subsequently funded by the Bonneville Power Administration (BPA). Under this program, spring Chinook are reared at RBH and the Pelton Ladder for later release into the Hood River subbasin. CTWS-BNR conduct monitoring and evaluation of juvenile spring Chinook at RBH used by the HRPP.

Modifications to the ladder were completed in 1995 to double the previous capacity of the ladder rearing program. This expansion allowed an additional 187,000 spring Chinook juveniles to be reared in the ladder. These modifications were made as a part of the above referenced HRPP.

1.6. Type of program.

The RBH spring Chinook program has two programmatic functions. It functions as an ISOLATED HARVEST program:

"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-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).

In addition, RBH also functions as an ISOLATED RECOVERY program. This program can be divided into two general 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 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 successfully used and volunteers were employed under the guidance of the ODFW's Salmon Trout Enhancement Program (STEP). The method that is currently being implemented is utilizing disease free fry releases. Beginning in 2007, large-scale fry releases of summer steelhead began in the waters above the project. In 2008, both summer steelhead and spring Chinook fry were outplanted into portions of their historic habitat. The release schedule 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. We anticipate that this program will continue to expand in future years (ODFW and CTWS 2008).

1.7. Goals of the program.

Three goals have been identified for the RBH spring Chinook program:

1) Produce 310,000 spring Chinook smolts annually ***to MITIGATE*** *for production and habitat losses caused by the Pelton-Round Butte Project.*

2) Raise 75,000 spring Chinook juveniles for transfer to the Hood River acclimation site in order to rebuild populations of spring Chinook into this river system. These fish are

reared from eyed eggs provided by The Hood River Production Program (HRPP) utilizing Hood River stock.

3) Produce between 325,000 and 430,000 spring Chinook fry to be released into appropriate habitat above the Project. This will occur until the reintroduction program goals have been attained and adults are released above the project to spawn naturally. The fry release program may continue at varying levels depending upon the number of adults released above, to assure that the habitat is fully seeded. The 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. Produce and release 310,000 spring Chinook smolts annually ***to MITIGATE*** *for production and habitat losses caused by the Pelton Round Butte Hydroelectric 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 Lake Billy Chinook in 1964, successful downstream migration of juvenile anadromous fish was prevented by confusing surface currents in Lake Billy Chinook, a large reservoir with a hypolimnic outlet (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 Regulatory Energy Commission (FERC), by the terms and conditions of their license, mandated that both summer steelhead smolts and spring Chinook be reared and released from RBH into the Deschutes River below the Pelton Regulating Dam.

The anadromous portion of the ISOLATED HARVEST program identified has two specific program elements: steelhead and spring Chinook. The spring Chinook portion of the RBH program is described below.

Hatchery production of spring Chinook began with releases in 1973 designed to meet the mitigation level of 1,200 adult spring Chinook, of which 600 were required to be mature females, returning to the Pelton Trap annually. Past experience suggested that this mitigation level can be met most years by raising and releasing up to 275,000 spring Chinook smolts annually. However, in recent years Round Butte Hatchery has had very low adult ChS returns. Beginning in 2014 the hatchery experienced such low returns that brood collection goals were not met. This in turn caused program shortfalls that brood year because after the higher-priority lower river production release goals were met, there were no ChS fry available for reintroduction releases. The low median SAR's exhibited by the Deschutes 66 stock ChS, combined with the added disease component related to

increased *C. shasta* prevalence, along with recent increases in production goals, warrant the need to release more smolts. Due to the hatchery's inability to release more smolts at the standard release size of 8 fish per pound due to budget and space constrictions, raising more smolts at a smaller size becomes an attractive option. Beginning with brood year 2015 ChS smolts (released April 2017), hatchery personnel initiated a six-year study to evaluate whether the number of adult returns can be increased by releasing a smaller smolt while maintaining current pond densities at release (10,000 pounds per ladder cell; Montgomery 2015). The accepted study design would produce a total of 380,000 smolts at release for a total net increase of 140,000 smolts released each year.

Since 1993, with the exception of several groups released in 1974, all spring Chinook released from RBH have received a unique fin mark and coded wire tagged, to determine the rearing origin (different cells of the Pelton Ladder) of fish.

Program features and hatchery operational guidelines are in place to minimize adverse effects of the spring Chinook program on listed steelhead and other Deschutes River fishes. First, only full-term spring Chinook smolts are released from RBH. This rearing strategy is made possible through aggressive grading and culling, favorable water temperatures for proper growth rates and feeding regimes. Second, smolts reared in the Pelton Ladder volitionally migrate out of the ladder and down the Deschutes River rather than being forced released.

The available evidence suggests that these strategies generally produce spring Chinook smolts that migrate quickly through the lower Deschutes. Lindsay et al. (1989) reported that median passage at The Dalles Dam in the Columbia was one to three weeks after release at river mile 100.0. Newton and Nelson (1995, 1996, 1997, 1998, 1999 and 2000) reported the incidental capture of very small numbers of hatchery fin marked spring Chinook juveniles during redband trout population inventories in the lower Deschutes.

More recent evidence continues to suggest that RBH-origin spring Chinook smolts migrate quickly through the Deschutes River and likely have little impact to listed species. Brun (2003) reported that spring Chinook salmon smolts (as determined by length) were captured only during late April while collecting juvenile fall Chinook by seine net. In 2009, the United States Fish and Wildlife Service began a PIT tagging study which will provide new insight to juvenile migration timing of hatchery-origin (RBH & WSNFH) and wild stocks. In 2016, PGE determined that the median travel time from release at Pelton Dam to the mouth of the Deschutes for radio-tagged Chinook salmon s was less than 3 days (Gonzalo Mendez, PGE, personal communication).

These observations suggest that the RBH spring Chinook program may have minimal adverse impacts on listed steelhead within the sub-basin, which are consistent with the findings of Steward and Bjornn (1990) who reported that the potentials for inter specific competition is considered minimal when migration-ready or full-term smolts are released.

While it appears that the majority of RBH spring Chinook juveniles emigrate quickly and completely through the Deschutes, the incidence of hatchery-origin mini-jack returns to RBH (as identified by coded wire tag recoveries at the Pelton Trap and elsewhere) can be

larger in some years than others. Observations made at the Sherars Falls' adult salmon and steelhead trap, angler harvest census immediately downstream to Sherars Falls, and at the Pelton Trap suggest that in some years, hundreds or thousands of spring Chinook juveniles (believed to be all males), exhibit a mini-jack life history pattern and reverse their downstream migration prior to leaving the Deschutes (ODFW unpublished data). The extent of downstream migration and their effect on the listed species from mini-jacks is unknown.

Large mini-jack "returns" of RBH-raised spring Chinook have also been documented in the Hood River. Over 900 mini-jack spring Chinook (classified through age analysis) returning from a total release of 137,000 smolts were caught at the Powerdale Dam upstream migrant fish trap in 2000 (Olsen 2001). An increased number of mini-jack spring Chinook was also noted from that release-year in the Deschutes (ODFW unpublished data). Apparently both the Deschutes and Hood River releases shared some commonality during that year which contributed to a higher rate of the mini-jack life history pattern.

The Pelton Ladder rearing regime takes advantage of more natural rearing conditions than the traditional raceways in hatchery environment. The flow regime of the ladder more closely approximates a stream rearing situation in that flows are higher and more unidirectional. Predators are more numerous in the ladder area since hatchery workers are infrequent visitors to the area. Additionally, workers believe that the presence of at least some natural food and the competitive interaction for that food increases the fitness and overall survival rate of fish from this rearing strategy. Juveniles rearing in the ladder are fed on demand one day per week from the day they are moved from RBH to the ladder on November 1 through the end of February, and then also on demand five days per week from March 1 until release in mid-April. Because of the presence of natural food in the Pelton Ladder rearing facility, it is possible that over-winter rearing in the ladder may produce larger smolts than the feeding schedule would indicate. Mild winters with higher water temperatures likely create these conditions. Shearer and Swanson (2000) have documented that larger smolts tend to be precocious males (i.e. mini-jacks) and had higher lipid contents as compared to the general hatchery population and concluded that feed with higher lipid levels resulted in a greater number of precocious fish. The adverse effect of the mini-jack life history pattern on listed fish in the Deschutes is unknown at this time.

In addition to the evidence cited above relative to releasing of full term smolts, it is widely recognized in the scientific literature that allowing smolts to volitionally migrate from the hatchery environment (as practiced at the Pelton Ladder) decreases the tendency of juveniles to residualize. Currently, the porthole gates in the Pelton Ladder are opened around mid-April and remain open until June 1st. During this time frame, the smolts are no longer fed to encourage their migration. Any Chinook smolts that remain in the Pelton Ladder after June 1st are removed and sacrificed. Sampling of these fish has shown that the vast majority are precocious males.

Goal 2. Raise 75,000 spring Chinook juveniles for transfer to the Hood River acclimation site in order to rebuild populations of spring Chinook into this river system.

These fish are reared from eyed eggs provided by The Hood River Production Program (HRPP) utilizing Hood River stock.

The possible impacts of this reintroduction program on listed stocks in the Hood River have been described in a separate HGMP on Hood River spring Chinook program.

Goal 3. Produce between 325,000 and 430,000 spring Chinook fry to be released into appropriate habitat above the Pelton Round Butte Hydroelectric Project. This will occur until the reintroduction program goals have been attained and adults are released above the Project to spawn naturally. The fry release program may continue at varying levels depending upon the number of adults released above, to assure that the habitat is fully seeded. The 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 project, 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 population in the Deschutes Basin to historical habitats above Round Butte Dam. Re-establishing spring Chinook in the Metolius River system may help secure the future of this population in the Deschutes River system. At this stage, it is difficult to speculate its effect on listed steelhead or bull trout.

1.9. List of program "Performance Standards" and

1.10. "Performance Indicators", designated by "benefits" and "risks."

See 1.10.1 and 1.10.2 below.

1.10.1. Performance Indicators – Benefits

BENEFITS Performance Standards	BENEFITS Performance Indicators	BENEFITS Monitoring and Evaluation
Selective harvests of spring Chinook released from RBH.	All spring Chinook smolts released from RBH will be fin marked and can be identified as to origin.	Conduct mark efficiency checks prior to release & monitor return/harvest of marked fish through creel survey.
Healthy, full term spring Chinook smolts are released from RBH.	Monthly fish health inspection by fish pathologist and conduct treatments as per prescriptions. Release about 310,000 healthy and certified smolts.	Conduct fish health check-up prior to release and also conduct pre-release sampling for length-weight and other indicators of smoltification.
Spring Chinook 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 and evaluate the performance of program fish.
Spring Chinook smolts released from RBH return to that facility	Adult returns to the Pelton Trap at sufficient levels, to produce	Operate the Pelton Trap to capture spring Chinook adults.

BENEFITS Performance Standards	BENEFITS Performance Indicators	BENEFITS Monitoring and Evaluation
in sufficient numbers to meet FERC-mandated mitigation requirements.	310,000 smolts on an annual basis.	
Spring Chinook smolts released from RBH return to that facility in sufficient numbers to meet in-hatchery broodstock needs.	Collect 1,100 adult and/or jack spring Chinook 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 adult returns will be utilized to initiate reintroduction program.	Produce 350,000 to 430,000 disease free fry annually.	Operate the Pelton Trap; differentiate adult returns by fin mark.
RBH 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 50,000 smolts).	Operate the Pelton Trap; differentiate adult returns by fin mark.

1.10.2. Performance Indicators – Risks

RISKS Performance Standards	RISKS Performance Indicators	RISKS Monitoring and Evaluation
Adults, jacks or mini-jacks of spring Chinook resulting 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 spring Chinook into other systems.	Monitor spring Chinook fin marks and genetic composition of adults returned to Hood River and other locations, as applicable.
Adult hatchery-origin spring Chinook shall not comprise more than 10% of the spawners in the natural spawning areas of the Deschutes.	In subbasin stray rates (as evidenced by fin mark or genetic analysis) of RBH spring Chinook into Warm Spring River or other Deschutes tributaries or the mainstem Deschutes.	Monitor spring Chinook fin marks and genetic composition at WSNFH trap and during spawning ground survey in Deschutes tributaries.
Hatchery operations comply with water quality standards.	RBH meets the requirements of its NPDES permit and other permitting, as appropriate.	Monitor water quality parameters of hatchery effluents, record data, and report to DEQ as per requirements.
Harvest of RBH spring Chinook adults with minimal impacts to listed species.	Numbers of non-target or wild salmonids caught in tribal and non-tribal fisheries and assumed hook mortality rates.	Conduct harvest monitoring of sport and tribal fisheries. Appropriate enforcement to minimize illegal take, and enforce bag limits, season limits and other fishing regulations as appropriate to the Deschutes River harvest management and protection of wild fish.
Releases of spring Chinook smolts from RBH minimize interactions with wild fish by swiftly and completely 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.

RISKS Performance Standards	**RISKS** Performance Indicators	**RISKS** Monitoring and Evaluation
Minimize disease risk to wild fish from hatchery operation.	RBH operation conforms to all ODFW and other applicable fish health management policies and operational guidelines.	Appropriate juvenile fish health monitoring will be conducted by ODFW pathologists. Wild juveniles will be periodically sampled to monitor disease load, if necessary.
Life history characteristics of RBH spring Chinook 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 spring chinook population.
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 harvest census locations, the Pelton Trap and other locations as appropriate.
Reintroduction program will not adversely impact native populations above the Project.	Follow the parameters outlined in the Reintroduction Plan, not to exceed habitat capacity.	Monitor fish growth, distributions outmigration timing, reservoir passage and survival.

1.11. Expected size of program.

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

The target number of spring Chinook broodstock is 1,100 adults for both mitigation and reintroduction programs. Additional spring Chinook broodstock for the Hood River spring Chinook program have been needed in some years during years of low returns to the Hood River, although the long term goal of the HRPP is to rely on Hood River returns for production needs. Broodstock collection for RBH includes only marked adult spring Chinook captured from the Deschutes River at the Pelton Trap and known to be of RBH origin.

It is estimated that between 300 and 400 (50% female) broodstock of adult spring Chinook salmon will be needed to support the reintroduction effort. It is expected that this will produce between 325,000 and 430,000 fed fry and eggs for 50,000 smolts that are identified in the Reintroduction Plan (ODFW & CTWS 2008). The fry will be raised at Round Butte Hatchery while eggs sufficient to produce the 50,000 smolts will be transferred to Wizard Falls Hatchery.

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

Proposed maximum releases numbers are displayed in Table 1.11.2.

Table 1.11.2. Proposed maximum annual release numbers of Chinook by life stage.

Goal	Life Stage	Maximum Number	Release Location
1	Smolt	310,000	Lower Deschutes River, RM 100
2	Smolt	75,000	These stock-66 smolts be transferred to Hood River Production Project (if HRPP is in shortage of egg production for stck-50)
3	Fed Fry	430,000	Whychus Creek, Crooked and Metolius, Deschutes Rivers
3[1]	Eggs	55,000	Transfer to other ODFW facility (currently Wizard Falls Hatchery) for smolt production in support of reintroduction.

[1] Although the smolt production aspect is identified in the Reintroduction Plan (ODFW & CTWS 2008), it is not defined in Round Butte Hatchery Annual Operating Plan as the smolts are raised at another hatchery facility.

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

All data relative to program performance reside either at the ODFW District Office in The Dalles or at RBH. Coded wire tag recovery data are also accessed through ODFW Headquarters or through the Pacific States Marine Fisheries Commission databases.

As will be discussed in detail below, two rearing and release strategies have been used for RBH spring Chinook. Releases of juvenile spring Chinook from RBH by brood year are displayed in Table 1.12a (See Attachment 1). Recoveries of RBH spring Chinook returning to the Deschutes River for the same brood years are presented in Table 1.12b (See Attachment 2). Brood year survival, expressed as survival to the mouth of the Deschutes, is displayed in Table 1.12c. Brood year survival has ranged from 0.09% to 2.33% for the period of record (See Attachment 3, Table 1.12c).

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

The PGE-funded mitigation program for Deschutes spring Chinook started in 1967 with the decision to terminate fish passage at the Pelton Round Butte Project (Ratliff and Schulz 1999). Smolts were reared at the existing State hatcheries until the 1972 brood for spring Chinook and 1973 brood for steelhead 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. The first year of spring Chinook unfed fry releases began in 2008, to reintroduce spring Chinook population above Pelton Round Butte Dam.

1.14. Expected duration of program.

RBH will maintain its mitigation program into the foreseeable future, and the reintroduction program will be re-evaluated approximately 10 years after the first returns of adult spring Chinook that were naturally produced from areas upstream of the dams and every 5 years thereafter. Production at the hatchery associated with the mitigation program may be phased down based on 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.

Production of spring Chinook smolts for liberation into the Hood River will remain at current levels at least through 2018. Results of hatchery evaluations being conducted through the HRPP will determine if the production levels will continue at current levels or be phased out (HDR/Fish Pro 2008).

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.

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.

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

Criteria And Goals For Safe, Timely And Effective Downstream And Upstream Passage	
Item	***Criteria and Goals***
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.
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 (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.

1.15. 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, mostly very cold and in nearly pristine condition. Anadromous fish habitat in the lower Crooked River subbasin will become accessible to adult anadromous fish when passage impediments at Opal Springs Hydroelectric Project (FERC Project No. 5891, "Opal Springs", a half-mile above the reservoir) and a few others are 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.

Mitigation Responsibilities:
The RBH spring Chinook program is a FERC mitigation program required for the Pelton/Round Butte hydroelectric project funded by PGE and operated by the ODFW. The original mitigation responsibility of the RBH (during the first FERC license period) was to have an annual return of 1,200 adult spring Chinook (600 females) 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. The original goal of the RBH program was to produce 240,000 smolts on an annual basis to meet the annual return of 1,200 adults to the hatchery. However, recently a variety of issues has not allowed RBH to meet its production goals. As a result, RBH initiated a six year evaluation, beginning with brood year 2015 ChS smolts (released April 2017), to evaluate whether the number of adult returns can be increased by releasing a smaller smolt while maintaining current pond densities at release (10,000 pounds per ladder cell).

Negative Ecological Interactions from Current Program:
Decades of research, monitoring and evaluation of the RBH spring Chinook program indicates the current program has minimally identified negative interaction with listed steelhead (or other Deschutes fishes). With the exception of some years when mini-jacks were noted at the Sherars Falls and the Pelton Traps, smolts released from RBH appeared to emigrate quickly and completely from the Deschutes. Returning adults do not appear to stray into other river systems on their upstream migration, and very little evidence of straying within the Deschutes has been documented. Furthermore, no evidence of spawning in the mainstem Deschutes by RBH or other spring Chinook has ever been observed. Rather, all three groups of spring Chinook in the lower Deschutes River (wild, WSNFH origin and RBH origin) appear to have strong site fidelity to the location of origin. Spring Chinook adults returning to the Pelton Trap are removed from the river at that time, eliminating further potential for in-river interactions with the listed species.

Fishery Impacts to the Listed Species:
Sport and tribal fisheries for spring Chinook in the Deschutes take place in mid-April through mid-June, a time when the fewest listed steelhead are present to be intercepted by this fishery. The sport and tribal spring Chinook fishery at Sherars Falls is monitored each year by a statistically expandable harvest sample. Less than 10 wild summer steelhead are estimated to be handled annually in this fishery. This fishery and its potential biological costs to the listed species have been fully described in the Middle Columbia River ESU Deschutes River, Small Direct Columbia Tributaries, Fifteenmile, Mill and Chenoweth creeks Fishery Management Evaluation Plans.

Hatchery Broodstock:
Broodstock for the current RBH spring Chinook program were developed from wild fish originally collected from the fish ladder at Sherars Falls in the late 1970's. It is highly likely that these fish were destined for the Warm Spring River, the same founding stock used for the WSNFH stock. The two hatchery facilities have supplied broodstock for each others need to supplement their own broodstock during years when their own returns were insufficient for production needs. From ODFW's fish culture and fish management standpoint, the two broods are considered interchangeable.

One potential source of concern relative to the RBH broodstock is the presence of hatchery-origin spring Chinook from other hatcheries that stray into the Deschutes and are captured at the Pelton Trap. For unknown reasons, a large increase in the number of stray hatchery-origin spring Chinook (as determined by coded wire tag recovery) was observed at the Pelton Trap in 1996. Some of these fish were subsequently incorporated into the RBH production during that brood year. Since that time, only spring Chinook verified through coded wire tag recovery and decoding to be of RBH origin are used in the hatchery production. However, since 1996, levels of out of basin strays recovered at the Pelton Trap have decreased significantly.

Fish Health:
Fish health management procedures and precautions will be followed according to the ODFW Fish Health Management Policy (OAR 635-007-0960 through 635-007-0985) during initial phases of fish reintroduction and remain in effect until a decision is made to move to volitional upstream passage of adult fish. Careful and detailed fish health monitoring, surveying, overview and precautions will be in place during the selective passage phase of the reintroduction.

RBH has had an ongoing fish health issue with bacterial kidney disease (BKD) in spring Chinook. Kokanee salmon (*Oncorhynchus nerka)* are resident in Lake Billy Chinook which carry varying levels of BKD. This is believed to be at least one of the reasons the disease remains a chronic challenge for RBH. A combination of both adult and juvenile treatments is employed to combat juvenile losses from BKD. All adults used as broodstock from the start of collection until July 1 are given an injection of erythromycin at a rate of 0.4 ml/fish at the time of capture.

The water source that enters the RBH incubation and rearing tank's water supply first passes through a series of sand and UV filters. This helps to reduce the risk of pathogens entering the facility.

All adults are sampled for the BKD pathogen and virus by ODFW pathologists at the time of spawning. All eggs are isolated by family group and numbered in the incubation trays. Once pathogens are diagnosed, all eggs from females with moderate to high levels of BKD are destroyed. Approximately 1,000,000 to 1,500,000 green eggs are taken which allow up to 300,000 eggs to be culled from production for disease management. Approximately 384,000 fry are ponded at the time of swim up. If the prevalence of BKD positive parents is low, additional fry are destroyed at ponding to avoid surplus production.

When the fingerlings reach a size of approximately 300 fish/pound they receive a prophylactic treatment of Aquamycin medicated feed to combat BKD. This treatment is administered at a rate of 100 mg/kg fish body weight for 28 days. After a two to three week period of no medicated feed, the treatment is repeated for another 28 day period.

Losses of juvenile spring Chinook at RBH due to infectious hematopoietic necrosis virus (IHNV) have been minimal even though adults are known to carry the virus. The methods of egg culling and fry destruction help to control the risks of both BKD and IHNV outbreaks.

Resident trout upstream of Round Butte Dam have been isolated from the remainder of the Columbia Basin for over 40 years. As such they have not been exposed to newly introduced or more virulent pathogens found downstream. The fish pathogens that have the greatest potential to adversely impact the Pelton Round Butte fish passage program, and existing fish populations upstream of PRB, are (1) *Myxobolus cerebralis* (whirling disease); (2) recently evolved strains of Infectious Hematopoietic Necrosis Virus (IHNV); (3) *Ceratomyxa shasta*, the causative agent of ceratomyxosis; and (4) *Renibacterium salmoninarum***,** the causative agent of bacterial kidney disease (BKD).

Myxobolus cerebralis is a myxosporean parasite and the causative agent for whirling disease. This parasite has a two-host life cycle including the fish and an oligochaete worm, *Tubifex tubifex*. The tubifex worm releases the infective triactinomyxon spores which infect the host fish. Spores released from salmonids in turn infect the worms. Infected salmonids can die from the infection or survive and exhibit lesions in skeletal tissues and deformities from destroyed cartilage. The most dramatic example of effects from this parasite have occurred in the Madison River in Montana where rainbow trout populations are reported to have declined to 25 percent of their former population levels following introduction of the parasite. To date, the only confirmed observations of *M. cerebralis* spores in the Deschutes River basin have come from fish downstream of PRB. These fish were strays from watersheds in Idaho, southwest Washington and northeast Oregon where the parasite is known to occur. The presence of *M. cerebralis* has not been confirmed in anadromous fish of Deschutes River basin origin.

Passing only fish of Deschutes River basin origin or adults known to have been reared in an *M. cerebralis* free environment reduces the risk of introducing the parasite to areas upstream of PRB. In order to minimize risk of introducing *M. cerebralis* with summer steelhead and Chinook salmon reintroduction, only egg or juvenile life stages will initially be released upstream. Adult Chinook salmon, summer steelhead, and sockeye salmon less than 20" in length returning to the Pelton Trap will only be passed upstream if they are known to have originated from areas upstream of PRB (Note: these fish will be migrating down and back up the Columbia risking exposure to the parasite; but this exposure will occur at a much less susceptible stage in their lives). Bull trout have been identified as having a low inherent susceptibility and exposure risk to *M. cerebralis;* so they pose minimal risk for transferring the parasite.

Whirling disease and other disease risks will be monitored by ODFW Fish Health Specialists as part of the overall fish health assessment and adaptive management strategy with corresponding integration of standard actions and procedures to avoid or minimize their effects. Although *M. cerebralis* has been identified as the most significant fish health risk for introduction, other pathogens such as Infectious Hematopoietic Necrosis Virus (IHNV) and Bacterial Kidney Disease (BKD) may also influence passage. Preliminary disease screening and management procedures for different stages of the anadromous fish reintroduction effort have been identified in the Fish Health Management Program Plan (PGE and CTWSRO 2006).

Fish Passage at the Pelton/Round Butte Hydro Complex:
Currently the Pelton/Round Butte hydroelectric complex at river mile 100 on the Deschutes River forms the upstream barrier to anadromous fish passage. Historically, spring Chinook were found in the Metolius River and tributaries with additional smaller populations likely occurring in Whychus Creek, and the Crooked River.

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, includes mandatory conditions 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 a Selective Water Withdrawal ("SWW") structure that has been constructed at Round Butte Dam to improve water quality in the lower Deschutes River subbasin and to create currents in the reservoir that should 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.

These alternatives with pros and cons are draft only to help protect or restore naturally spawning population; and are not necessarily being endorsed by ODFW.

Alternative 1. Eliminate spring Chinook production at RBH.
This alternative will eliminate all adverse impacts on listed fish, but elimination of the program would not contribute to meeting FERC-mandated spring Chinook mitigation or program goals.

Alternative 2. Either increase or decrease spring Chinook production at RBH.
Program adult return goals had been met fairly routinely through time, suggesting that increasing the number of juveniles released was not warranted. However, beginning in 2014, the hatchery experienced such low returns that brood collection goals were not met. This pattern continued in 2015 and 2016, which caused program shortfalls such that after the higher-priority lower river production release goals were met, there were limited or no ChS fry available for reintroduction releases. Preliminary run forecast for 2017 is better than the previous two years it is still below average and barely adequate to meet brood collection needs. Decreasing production would jeopardize the continued ability of the program to consistently meet return and mitigation goals.

ODFW proposes to implement this alternative in order to conduct a study to continue to meet current program goals and objectives.

Alternative 3. Modify rearing, size at release, time, release locations or other production scenario. Years of research and observation of the ecological interaction of the RBH spring Chinook program with other fishes in the Deschutes River suggest that a minimum negative interaction is currently taking place and it would not likely contribute to meeting program goals and objectives by making wholesale changes to the program at this time. However, recent broodstock shortfalls have prompted a study of effect of size at release in meeting program goals.

Alternative 4. Relax current broodstock collection and identification strategies.
The management authority has a strong desire to maintain the existing RBH broodstock collection and fish marking strategies, to ensure the genetic integrity of the population and minimize the risks of genetic interactions with other stock or population.

Alternative 5. With successful downstream collection efficiencies and the Round Butte fish passage facility, the current commitment to fish health monitoring and pathogen control above the hydroelectric project may be modified to allow for adults to be passed without screening. Lessening a commitment to fish health could have potential negative effects to both the hatchery program and disease load in the wild.

Alternative 6. Utilize wild or Warm Springs National Fish Hatchery stock for potential reintroduction of spring Chinook upstream of the Pelton/Round Butte hydroelectric complex. 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 7. Continue the current RBH spring Chinook program as outlined above. A combination of factors has recently made meeting program goals and objectives difficult to impossible under the previous release scenario of 240,000 smolts.

1.16.3. Potential reforms and investments.

The following reforms and investments are draft ideas only for further discussion and do not represent final decisions by the agency.

Reform/Investment 1. RBH stock spring Chinook are presently utilized for reintroduction purposes upstream of the Pelton/Round Butte complex. Currently, the RBH is able to manage the increases in production; 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. Investment costs for increased facilities have not been estimated.

Reform/Investment 2. Continue the current level of commitment to the RBH spring Chinook program into the future to ensure program success and a minimum of interaction with the listed fish in the Deschutes River. No additional investment is required.

2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

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

The HGMP for this program was submitted to NOAA on 4/5/04, which serves as 'take' authorization for the ESA-listed fish. This is an updated version of the previously submitted HGMP. Also, 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 (NOAA 2005). USFWS Biological Opinion (FWS # 1-7-04-0045) (USFWS 2004). Oregon Scientific Taking Permit for Fish and Marine and Freshwater Invertebrates issued by NOAA Fisheries file# 14865. (NOAA 2010). Scientific Taking Permit for Fish issued by Oregon Department of Fish and Wildlife (ODFW 2010).

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

ESA-listed wild summer steelhead juveniles use the lower Deschutes River to rear for one to four years before migrating to the ocean. They typically return as adults 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 samples of lower Deschutes River origin wild adult summer steelhead (Olsen et al. 1991). Typical of other 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 not to 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).

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 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 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 <u>directly</u> affected by the program.

No ESA-listed fish are taken directly for the RBH spring Chinook mitigation program.

(b) Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program

Summer steelhead listed as threatened by the National Marine Fisheries Service and Bull Trout listed as threatened by the USFWS may be incidentally affected by the operation of the Pelton Trap during brood stock collection activities. It is anticipated that 5 wild summer steelhead and 1 bull trout may be lost to indirect take (NMFS 2010).

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. Table 2.2.2.a was derived from the plan and assigns overall population viability ratings for the wild population in the Deschutes River Basin.

Table 2.2.2.a Viability assessment results for Mid-C steelhead populations in the Deschutes River Basin.

Population	Extant/ Extinct	Abundance		Productivity			Goal A	Goal B	
							Natural		
			Lower		Lower	A/P	Processes	Diversity	Integrated
		Mean	90%	Mean	90%	Risk	Risk	Risk	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

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 threshold of 1,000. The point estimate of productivity (1.89) puts the population into the very low risk region; however, the 90% CI extends well below the 25% risk level. This wide standard error results in a low risk level for abundance/productivity (A/P). The spatial structure/diversity rating is 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 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 Populations includes those populations that would occur in Whychus Creek and the Deschutes Crooked Population both would reside above the Pelton Round Butte Hydropower Project. As part of the Reintroduction program hatchery steelhead fry 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.

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 2.2.2b).

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 22 years of record (Table 2.2.2c) (Hand and Olson, 2003).

Table 2.2.2b. Estimated number of steelhead that migrated past Sherars Falls, by type and by run year, 1977 to 2007.

Run Year	Wild	Round Butte Hatchery	Stray Hatchery	Total
1977-78	6,600	6,100	900	13,600
1978-79	2,800	3,200	300	6,300
1979-80	4,200	5,400	600	10,200
1980-81	4,100	5,500	500[a]	10,100
1981-82	6,900	3,800	1,200[a]	11,900
1982-83	6,567	3,524	1,249[a]	11,340
1983-84	8,228[b]	7,250	7,684[a]	23,162
1984-85	7,721[b]	7,563	3,824[a]	19,108
1985-86	9,624[b]	7,382	5,056[c]	22,062
1986-87	6,207[b]	9,064	9,803[c]	25,074
1987-88	5,367[b]	9,209	8,367	23,943
1988-89	3,546	3,849	2,909	10,304
1989-90	4,278	2,758	3,659	10,695
1990-91	3,653	1,990	2,852	8,495
1991-92	4,826	3,778	8,409	17,049
1992-93	904	2,539	4,261	7,704
1993-94	1,487	1,159	4,293	6,936
1994-95	482	1,781	4,391	6,654

Run Year	Wild	Round Butte Hatchery	Stray Hatchery	Total
1995-96	1,662	2,708	11,855	16,225
1996-97	3,458	5,932	23,618	33,008
1997-98	1,820	5,042	17,703	24,465
1998-99	3,800	3,527	11,110	18,437
1999-2000	4,790	2,628	13,785	21,203
2000-2001	8,985	4,380	15,072	19,310
2001-2002	8,749	9,373	25,263	31,784
2002-2003	9,363	8,880	15,203	23,004
2003-2004	5,524	5,265	11,511	22,300
2004-2005	3,161	9,356	4,354	16,871
2005-2006	3,432	10,497	5,868	19,797
2006-2007	3,986	25,945	6,589	36,520

a/ May include some AD CWT marked steelhead that originated from Warm Springs NFH although few of these marked fish ever returned to that facility.
b/ May include some unmarked hatchery steelhead outplanted as fry into the Warm Springs River from Warm Springs NFH.
c/ May include adults from a release of 13,000 smolts from Round Butte Hatchery that were accidentally marked with the same fin clip as steelhead released from other Columbia basin hatcheries.

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

BROOD	WILD				HATCHERY			
YEAR	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	189	388		577			89	89
1986	133	240		373			56	56
1987	234	588		822			692	692
1988	131	391		522			699	699
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

BROOD	WILD				HATCHERY			
YEAR	M	F	Unk	TOTAL	M	F	Unk	TOTAL
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
2004			282	282			182	182
2005			321	321			61	61
2006			256	256			86	86
2007			395	395			278	278
2008			305	305			155	155

Bull trout, while present in the lower Deschutes River, are believed to spawn in the tributaries. Managers believe that this separation prevents interaction between spawning bull trout and RBH-produced spring Chinook. Bull trout found in habitat likely impacted by RBH produced fish are thought to be foraging fish produced in Warm Springs River and Shitike Creek. Brun and Dodson (2002) estimated that most bull trout juvenile rearing takes place in those two systems.

(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 2.2.2b). Wild spawning escapement into Warm Springs River is most accurately measured by counts at the WSNFH barrier dam (Table 2.2.2c).

Limited summer steelhead spawning ground counts are conducted annually by ODFW personnel on the eastside tributaries of Buckhollow, Bakeoven creeks and in the Trout Creek system (Table 2.2.2d and Table 2.2.2e). These data are not sufficient to establish total wild or hatchery spawning abundance.

Table 2.2.2d. Summer steelhead redd counts in Bakeoven and Buckhollow Creek.

Return Year	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
2006	surveys incomplete*	
2007	surveys incomplete*	
2008	surveys incomplete*	
*Landowner denied access		

Table 2.2.2e. 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	Live Fish	Redds	Redds/Mile
1988	9.4	17	23	2.5
1989	10.5	24	23	2.2
1990	14.4	22	42	2.9
1991	16.9	3	16	1.1
1992	16.4	6	6	0.4
1993	28.2	4	15	0.5
1994	16.25	0	0	0.0
1995	18.25	0	8	0.4
1996	21.75	4	5	0.2
1997	23.6	21	50	2.1
1998	28	13	44	1.6
1999	28.65	12	59	2.1
2000[a]	54.1	39	461	8.5

Year	Miles Surveyed	Live Fish	Redds	Redds/Mile
2001	36.6	56	595	16.3
2002	65.2	95	866	13.3
2003	65.4	48	789	12.1
2004	64.1	11	277	4.3
2005	No Surveys Due To High Water			
2006	No Surveys Due To High Water			
2007	66.0	20	425	

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.

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 (Pribyl et al. 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.

Over 20 years of research and observation indicate that RBH origin spring Chinook do not spawn in the wild and are not allowed access into the principle wild spring Chinook spawning area upstream from the barrier dam at WSNFH and likely do not have a measurable impact to listed summer 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 periods of time. Generally, the trap is operated and all fish are removed three times per week Lethal take is minimized by promptly returning wild steelhead and bull trout to the Deschutes River via a 10” watered PVC pipe. The operation of the Pelton Trap for collection of spring Chinook and summer steelhead broodstock for this mitigation program is the one hatchery activity that is most likely to impact wild summer steelhead adults. Based on the timing of this activity and the low number of wild steelhead contacted, this impact is likely to be small.

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, but not as a part of this Chinook program. A sample of steelhead ascending a fish ladder at Sherars Falls are captured and tagged from Mid-June through October each year. 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. Fish entering the trap will be captured, tagged (floy) and tissue samples may be taken. The risk to listed steelhead is low from hatchery activities and the likelihood of mortality from these activities is very low (NMFS 2010).

(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 are no direct take of wild summer steelhead due to the spring Chinook hatchery program. With the exception of past wild steelhead collections for brood stock, direct take of listed fish by hatchery operations has been very small through time. However, 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 out-migrate through the upper basin watershed. Currently, requests are being made to utilize wild steelhead in the reintroduction effort. Records on observed injury rates have never been kept at the Pelton Trap, handling mortality at that facility has never occurred. 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).

Table 2.2.3a. Number of wild summer steelhead captured at the Pelton Trap during April through August, by run year.

RunYear	Wild Steelhead
95-96	32
96-97	126
97-98	194
98-99	155
99-00	83
00-01	114
01-02	282
02-03	207
03-04	104

RunYear	Wild Steelhead
04-05	79
05-06	97
06-07	202
07-08	135
08-09	178
09-10	398
10-11	215
11-12	138
12-13	158
13-14	64
14-15	174
15-16	57

(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. Approximately 100 wild summer steelhead (50 females) would be utilized annually as future broodstock to seed the habitats above PRB and for integration into the RBH broodstock. Assuming use of limited numbers of natural-origin adults for broodstock is approved, Table 2.2.3b provides a projected annual take for natural-origin summer steelhead adults, 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).

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

Listed species affected: Deschutes wild summer steelhead ESU/Population: Mid-Columbia Activity: Adult Trap				
Location of hatchery activity: Round Butte Hatchery Deschutes River Dates of activity: Jan 1 to Dec 30 Hatchery program operator: ODFW and PGE Staff				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
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	

Listed species affected: Deschutes wild summer steelhead ESU/Population: Mid-Columbia Activity: Adult Trap				
Location of hatchery activity: Round Butte Hatchery Deschutes River Dates of activity: Jan 1 to Dec 30 Hatchery program operator: ODFW and PGE Staff				
Intentional lethal take f)				
Unintentional lethal take g)			15	
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.

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 wild fish prior to return to the river.

3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1. Describe alignment of the hatchery program with any ESU-wide hatchery plan or other regionally accepted policies. Explain any proposed deviations from the plan or policies.

This hatchery program will be operated consistent with the Oregon Plan for Salmon and Watersheds, all applicable Oregon Administrative Rules (OAR), and basin and subbasin plans approved by the Oregon Fish and Wildlife Commission.

More specifically, this hatchery program is managed consistent with the Lower Deschutes River Fish Management Plan (ODFW 1997; approved by the Oregon Fish and Wildlife Commission, July 1997). This is also consistent with the Oregon Plan for Salmon and Watersheds (Oregon Plan or OPSW). The Oregon Plan established by the Oregon Legislature in 1997, is a prescriptive set of measures for improving watersheds and thereby recovering threatened and endangered salmon and steelhead and meeting federal water quality standards throughout Oregon.

The Oregon Fish and Wildlife Commission adopted the Native Fish Conservation Policy (NFCP) in 2002. The NFCP (OAR 635-007-0502 through 0509) provides a framework to protect and enhance Oregon's naturally produced native fish populations through the development of conservation plans for Species Management Units (SMU) in the state. A new Hatchery Management Policy (HMP) was also adopted. The HMP (OAR 635-007-0542 through 0548) requires that Hatchery Program Management Plans (HPMPs) be developed for each hatchery program. HGMPs will serve as HPMPs if they are consistent with guidance provided in the HMP and conservation plans for the SMU. Conservation plans under the NFCP will provide guidance for hatchery programs of species within the associated SMU. ODFW intends to develop a conservation plan for mid-Columbia spring Chinook sometime in the near future. Once the conservation plan for spring Chinook is developed, this HGMP will be reviewed and possibly revised. If the HGMP is revised, it will be re-submitted to NOAA Fisheries. Through various avenues, including only releasing full term, migration ready smolts and removing hatchery spring Chinook adults captured at Pelton Trap, the RBH spring Chinook program is attempting to be consistent with the guidance provided in the NFCP.
Fish health management procedures and precautions will be followed according to the ODFW Fish Health Management Policy (OAR 635-007-0960 through 635-007-0985) during initial phases of fish reintroduction and remain in effect until a decision is made to move to volitional upstream passage of adult fish. Careful and detailed fish health monitoring, surveying, overview and precautions will be in place during the selective passage phase of the reintroduction.

Conservation and Recovery Plan for Oregon Steelhead Populations in the Mid-Columbia Steelhead Distinct Population Segment (Carmichael 2009). Key elements of the plan include identifying the current population status, 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. List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

a. ODFW Lower Deschutes River Subbasin Fish Management Plan (ODFW 1997).

b. ODFW Anadromous Fish and Bull Trout Management in the Upper Deschutes, Crooked, and Metolius River Subbasins (Marx 2003).

c. 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.

d. The Pelton Round Butte Project, Fish Passage Plan (Ratliff et al. 2001) was approved by to the Federal Energy Regulatory Commission (FERC) with the issuance of the FERC license in June 2005. The Fish Passage Plan serves as the basis for fisheries mitigation associated with the Pelton Round Butte Project (FERC # 2030).

e. 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).

f. Planning and efforts toward reintroduction of anadromous fish upstream of the Pelton Round Butte Project and fish passage are consistent with ODFW Fish Management plans for the Crooked River (ODFW 1996a), Upper Deschutes River (ODFW 1996b), and the Metolius River (ODFW 1996c).

g. 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).

h. ESA Section 4(d) Rules for listed wild Steelhead on the Lower Deschutes River (50 CFR Part 223).

i. DEQ Memorandum of Agreement regarding fish carcass distribution in Oregon streams**.** (Note: although carcasses are placed in Shitike Creek, this stream is entirely within the Warm Springs Reservation and is not included in the DEQ/ODFW MOU, ODFW and ODEQ 2002).

j. Artificial Production Review and Evaluation (Northwest Power and Conservation Council 2004). The goal of the review is to develop coordinated policies for the use of artificial production in the Columbia River Basin.

k. Columbia River Hatchery Reform System Wide Report (Hatchery Science Review Group 2009).

l. Operation plans for anadromous fish production facilities in the Columbia River Basin (IHOT 1996).

m. Round Butte Hatchery is operated under the NPDES general permit 300J issued by the Oregon Department of Environmental Quality, to maintain environmental quality of hatchery effluents.

n. US v. Oregon 2008-2017 management agreement, including the updated 2010 production tables. (US v. Oregon May 2008)

3.3. Relationship to harvest objectives.

The mitigation goals that led to the construction of RBH during the initial FERC license were based on returns to the Pelton Fish Trap and have no explicit harvest goals (Ratliff and Schulz 1999). However, the conditions for the new FERC license addresses harvest because ODFW has stated that one of the primary purposes of maintaining hatchery production, while attempts are made to reestablish anadromous runs and passage upstream, is to provide harvest opportunities (Pribyl et al. 1997).

One of the objectives for spring Chinook is to:
"provide the opportunity to harvest wild spring Chinook salmon when returns are greater than the optimum wild adult spawning escapement of 1,300 adults; and to provide the opportunity to harvest RBH and Warm Springs National Hatchery origin spring Chinook salmon that are excess to brood stock needs."

To support this objective all the spring Chinook smolts liberated from RBH are adipose clipped and coded wire tagged to facilitate positive identification. The adipose fin mark has allowed for hatchery only spring Chinook harvest in the lower Deschutes in recent years, when wild escapements are predicted to be met.

The 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.

Sport and tribal spring Chinook fisheries in the lower Deschutes subbasin directly benefit from the RBH program through higher catch rates. Catch of RBH origin spring Chinook in the Deschutes subbasin fisheries are presented in Table 1.12b. It is difficult to quantify; however, RBH stock contribution to non – tribal commercial fisheries downstream of Bonneville Dam, sport fisheries in the Zone 6 fishery between Bonneville and John Day Dam and contribution to Tribal ceremonial, subsistence, and commercial fisheries in Zone 6.

In fact, the presence of RBH and WSNFH origin spring Chinook have made consumptive harvest of spring Chinook possible in years when returns of wild spring Chinook are not large enough to meet spawning escapement and provide consumptive harvest.

3.4. Relationship to habitat protection and recovery strategies.

The major factors affecting natural production of summer steelhead in the lower Deschutes River are the quantity and quality of habitat for these species (Carmichael 2009). The hatchery program is not directly related to habitat but is an outgrowth or attempt to mitigate for the loss of access to habitats for these species upstream of the Pelton-Round Butte Project. The major mitigation effort during the new FERC license for the Pelton Round Butte Project is expected to be reconnection to these habitats. 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 interactions. (describe salmonid and non-salmonid fishes or other species that could be impacted).

RBH liberated approximately 240,000 spring Chinook smolts annually into the lower Deschutes River until 2017, when releases were increased up to 310,000 as part of a six-year study. These fish may have the following ecological interactions with other salmonid and non-salmonid species.

(1) *Species that could negatively impact program:* The program may be negatively impacted by a variety of freshwater and marine predators during migration periods such as northern pikeminnow, smallmouth bass, seagulls, cormorants, Caspian terns, and pinnipeds which could significantly reduce overall survival rates of program fish.

(2) *Species that could be negatively impacted by program:* The ESA-listed Deschutes River summer steelhead and other salmonid populations in the mainstem Columbia River migration corridors could be negatively impacted by the program fish. Impacts could potentially occur from competition for food, space, predation, disease transmission, or density dependent effects. Every effort is made to release program fish as full-term smolts that are ready to emigrate quickly to the ocean, and thus minimize the time of negative ecological interactions with other species. Decades of research, monitoring and evaluation of the RBH spring Chinook program indicates the current program has minimum identifiable negative interaction with listed steelhead (or other Deschutes fishes); and other available evidence suggests that RBH origin spring Chinook smolts migrate quickly through the Deschutes River and likely have little impact to listed species. Also, returning adults do not appear to stray into other river systems on their upstream migration, and very little evidence of straying within the Deschutes has been documented. Furthermore, no evidence of spawning in the mainstem Deschutes by RBH or other spring Chinook has ever been observed.

(3) *Species that could positively impact program:* Other salmonid species that naturally spawn in the target stream may positively impact program fish by contributing nutrients from decaying carcasses that increase productivity of the Deschutes River.

(4) *Species that could be positively impacted by program:* The program fish provides a benefit to other salmonid species in the basin by contributing nutrients from decaying carcasses that increase productivity of the Deschutes River. Spring Chinook also play an important role in community ecology of the river since this population historically existed sympatrically with other species within the basin.

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.

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 50ºF 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 50º F (10° 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, parasites do not find their way through the rock, and thus RBH has very low external parasite loads. Analysis of a variety of water chemistry parameters are presented in Table 4.1.

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

	West Bank Spring			Brood Spring			Raceway		
Analysis	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
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				mg/L	0.11	3/31/1975			

	West Bank Spring			Brood Spring			Raceway		
Analysis	Units	Results	Date	Units	Results	Date	Units	Results	Date
a									
Chlorophyll b				mg/L	0.42	3/31/1975			
Chlorophyll c				mg/L		3/31/1975			

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 legal standards should minimize the potential take of listed species.

5. FACILITIES

5.1. Broodstock collection facilities (or methods).

All broodstock are collected in the Buckley Type Fish Trap at the Reregulating Dam (RM 100.1. The trap is checked once or twice per week depending on the numbers of fish captured and the time of year. The fish are contained in a holding area of approximately 2200 ft^3 (18'X18'X7') with a flow of approximately 3 cubic feet per second (cfs) (Duke Engineering 1999). Fish are pushed toward a hopper gate by a wooden braile 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, oxygen, and a buffer. When the fish have been anesthetized, they are separated into broodstock, river returns, or fish to be given away for human consumption. Broodstock spring Chinook are inoculated with Erythromycin and returned to a holding area inside the hopper. When one batch has been processed, the hopper is raised and moved above the liberation truck for a water-to-water transfer.

A study conducted in 1997 (Fritsch et al. 1997) concluded that the current operation of only the east tunnel 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 is a 1,600 gallon Model 7400, DT – 530 International. 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. This truck is used for moving both adults from the Pelton Trap and smolts to the Pelton Ladder rearing cells.

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

5.3. Broodstock holding and spawning facilities.

Each pond is approximately 15'X50' with approximately 900 gallons per minute (gal/min) upwelling water flow from Round Butte Dam grout tunnel seepage. The ponds are covered with a roof, but they are not enclosed in a building. Six foot tall fencing keeps predators out of the holding ponds.

5.4. Incubation facilities.

The incubation room measures approximately 20'X20' and contains 21 stacks of 16 Heath trays per stack. The water source is from Round Butte Dam leakage and has been found to be clean of contaminants and well oxygenated (Table 4.1). Water is approximately 10°C but can be chilled to 5°C or warmed to 12.5°C as needed to adjust timing of egg development. Spring Chinook eggs are treated once a day until hatch with a formalin drip to combat soft shell disease and fungal growth. All water that is supplied to the incubation trays flows through a series of sand filters and UV sterilizers to remove and reduce virus and bacteria.

5.5. Rearing facilities.

There are twenty four 6-ft diameter, 4 foot deep circular tanks for rearing fry that are plumbed to a water supply of nearly constant temperature of about 10°C, which is seepage from Round Butte Dam. All water that is supplied to the circular tanks runs through a series of sand filters and UV sterilizers to remove and reduce virus and bacteria. Dissolved oxygen content of the water is nearly 100% saturation. They have 1/16 inch mesh tank screens that allow water to escape but prevent fry from doing so. Flow in these tanks is generally about 15 gallons per minute (gpm). Each tank is outfitted with an alarm that sounds outside the hatchery office and at the Round Butte operator's office when water level is about ½ between the normal water level and the top of the screen column. These tanks are covered by a metal shed that was installed in 2001. Mortalities are removed from the tanks that are cleaned daily. Each tank has its own tools (mesh scoops, brushes, aquarium type nets) for removing mortalities and cleaning.

After spring Chinook reach about 350 fish per pound (fish/lb), they are transferred to one of the 10 Burrows-type ponds. Fry that are being utilized in the reintroduction program are placed in separate rearing ponds, for approximately 2-3 weeks, until they are ready

for outplanting. Each raceway is mostly self-cleaning but also has its own set of picking and cleaning tools to prevent cross contamination. The water level of the raceways is controlled by the height of standpipes at the outflow. The water source is seepage from Round Butte Dam that maintains a fairly constant temperature of 11°C.

All ponds are pressure washed between fish occupations to prevent algal growth and clogging of the screens. All ponds are equipped with alarms that sound outside the hatchery office and at Round Butte operator's office when there is excess or insufficient water. All of the ponds are equipped with sprinklers providing spray over the water surface that prevents sunburn of 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.

When the juvenile Chinook are approximately one year old in early November, they are transferred from the Burrows-type rearing ponds at RBH to the one of six sections (cells) of the Pelton Ladder for rearing. These cells are separated from one another by electrically driven rotary screens for both RBH mitigation and for BPA sponsored Hood River supplementation. The water for the ladder comes from either a surface or a deep intake in Lake Simtustus and travels over 2 miles down the ladder before reaching the rearing cells at the lower end of the ladder.

Because the water is not filtered through any substrate, it contains a variety of food organisms. These fish are also fed on varying schedules. Water temperature in the ladder varies from 1°C to 12°C during the period that spring Chinook are reared. Rearing temperature is controlled by the outside PGE crew by a series of valves on Pelton Dam.

In February, smolts destined for the Hood River program are trucked from cell 5 of the Pelton Ladder to an acclimation site in the West Fork Hood River subbasin. In April, the smolts in the other three rearing sections of the Pelton Ladder are allowed to volitionally emigrate from the ladder into the lower Deschutes River, below the Pelton Regulating Dam.

5.6. Acclimation/release facilities.

All RBH spring Chinook are raised, acclimated and released from the Pelton Ladder. Release is entirely volitional. Non migrants remaining in the cells at the end of the six week volitional release period are euthanized.

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. A group of approximately 100,000 spring Chinook eggs was lost in 1992 when the arm on the thermograph was accidentally moved and warm water bathed the incubation trays instead of chilled water. In 1973, an experiment to determine if steelhead smolts could be produced in significant numbers from releases of fingerlings in Project reservoirs 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.

RBH has alarms that monitor all functions critical to its operation. All alarms are wired into the Round Butte operator's office. Should an alarm go off when no one is at the hatchery, the operator is instructed to call the hatchery person on standby duty. Broodstock ponds have been covered and enclosed with a fence to exclude river otters. The addition of a building to the spawning slab reduces the accumulation of ice that may freeze the water lines. The water that feeds into the incubation trays and the rearing tanks is plumbed through a series of sand filters before passing through 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 Reregulating Dam. Water-flow through the trap is controlled by manual valves. In 2009, updated adult recovery facilities were constructed at the Pelton Trap. The wild adults are placed in a 400 gallon, aerated, oxygenated, stainless steel tank, they recover from the effects of the CO_2 (utilized as an anesthetic), in buffered fresh water. Once the fish are recovered they are sluiced back via a return tube to the lower Deschutes River.

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.

Spring Chinook originally spawned in the Metolius River and in lower Squaw Creek (Nehlsen 1995; Ratliff and Schulz 1999). The RBH spring Chinook program originally used these fish as broodstock. The failure of fish passage facilities at the Pelton-Round Butte Project essentially extirpated this stock; and before the spring Chinook hatchery program could be successfully started, another source of broodstock was needed. As described in detail below, the RBH current spring Chinook brood stock (Deschutes stock) was supplemented during the late 1970s using wild spring Chinook captured at the Sherars Falls Fish Ladder. It is believed that these adults were destined for the Warm Springs River, a west-side tributary to the Deschutes River located on the Confederated Tribes of Warm Springs reservation.

6.2. Supporting information.

6.2.1. History.

Spring Chinook Brood Stock Selection and Maintenance: Initial spring Chinook selection included the earlier-running Chinook entering the Pelton Fish Trap in 1972. These fish were first held at the Hood River Hatchery, then in the lower Pelton Fish Ladder, or later in the 10-ft x 30-ft oval ponds at the RBH site. However, the success of the early hatchery program, both during the transition period when smolts were reared at ODFW facilities and the early brood years at RBH, was marginal, at best. In 1978, the spring Chinook run into Pelton Trap had dwindled to only 20 adult "spring Chinook", considerably less than the number needed for broodstock (Ratliff and Schulz 1999).

Some early fall Chinook (called "summer Chinook" in hatchery records) were reared at RBH from 1974 to 1978 to allow full production at the hatchery (Nyara 1989). During the four-year period from 1977 to 1980, additional spring Chinook brood stock (194, 115, 89, and 60 fish respectively) were captured from a trap in the Sherars Falls fish ladder after consultation with the CTWS –BNR (Ratliff and Schulz 1999; Culpus 1980). These wild adults were almost certainly destined for the Warm Springs River since the incidence of out-of-subbasin wild spring Chinook straying is thought to be low. With increasing spring Chinook runs from the RBH program into the Pelton Trap starting in 1981, outside brood stock was no longer needed (Lindsay et al. 1989).

6.2.2. Annual size.

The proposed brood collected level is 1,100 adults for both mitigation and reintroduction programs. Annual spring Chinook broodstock collection at RBH is displayed in Table 6.2.2.

Table 6.2.2. Number of Deschutes stock spring Chinook collected for RBH broodstock at the Pelton Trap, 1990-2009.

Brood Year	Hatchery Origin		Wild	
	Adult	Jack	Adult	Jack
1990	478	38	17	5
1991	561	52	29	3
1992	489	24	39	3
1993	364	31	52	0
1994	490	59	47	2
1995	671	100	27	1
1996	422	21	45	0
1997	406	29	70	1
1998	268	47	16	1
1999	603	24	18	0
2000	416	65	20	2
2001	607	16	0	0
2002	615	14	0	0
2003	421	10	0	0
2004	338	34	0	0

Brood Year	Hatchery Origin		Wild	
	Adult	Jack	Adult	Jack
2005	543	29	0	0
2006	483	27	0	0
2007	589	34	0	0
2008*	843	45	0	0
2009*	942	10	0	0
2010*	739	18	0	0
2011*	863	33	0	0
2012*	798	38	0	0
2013*	818	26	0	0
2014*	371	35	0	0
2015*	552	30	0	0
2016*	524	49	0	0

*additional broodstock collected for reintroduction program

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

Historic numbers of unmarked spring Chinook adults used for broodstock through the years is unknown. The hatchery program was initiated from wild spring Chinook destined for the Metolius River. From 1978 through 1980, wild Warm Springs River adults were utilized as mentioned earlier. Relatively few wild spring Chinook are captured in most years because the Deschutes River, at this location, is used primarily dominated by ocean-type 0-age migrant fall Chinook. Since 2000, unmarked spring Chinook have not been incorporated into the broodstock due to disease concern. See Table 6.2.2 above for the past broodstock collection level of hatchery-origin and wild fish. The proposed collection level of 1,100 adults are only hatchery-origin fish.

6.2.4. Genetic or ecological differences.

Phenotypic or behavioral differences have not been observed between RBH spring Chinook and wild Warm Springs River (Deschutes stock) spring Chinook. Recent genetic analysis has demonstrated that 1) Deschutes Basin Spring Chinook salmon are distinct from other Columbia River chinook, 2) within the Deschutes basin, the primary divergence is between Round Butte and Warm Springs chinook, 3) natural-origin Warm Springs fish returning now are similar to those that returned prior to inception of the Warm Springs National Fish Hatchery, and 4) hatchery-origin fish from Round Butte (and to a lesser extent Warm Springs) exhibit genetic characteristics typical of hatchery fish (Smith et al. 2014).

6.2.5. Reasons for choosing.

The native, wild Warm Springs River (Deschutes stock) spring Chinook was available at the time of program development and was geographically proximate, making it the logical founding stock.

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.

No adverse genetic effects to listed steelhead are anticipated from the spring Chinook brood stock selection practices. However, to minimize the ecological impacts, broodstock are inoculated with oxytetracycline and/or erythromycin and treated whenever necessary, to prevent transmission of diseases to the watershed and its inhabiting native fish populations. Also, all selected broodstock are examined to determine the presence of detectable viral pathogens. If fish being utilized for spawning are found to be infected with moderate to high levels of BKD or IHN, the fertilized eggs from infected parents are culled and destroyed from the incubation trays. Only eggs that are taken from virus free parents will be utilized for the reintroduction effort, to minimize the risks of disease transmission.

7. BROODSTOCK COLLECTION

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

Adults will be captured in Pelton Trap for broodstock of all programs associated with RBH.

7.2. Collection or sampling design.

Prior to 1993, approximately 75 adults and 10 jacks were transferred weekly to the hatchery during May and June. Since then, the numbers transferred have increased to meet the increased goals with the BPA ladder-rearing and reintroduction programs. As with steelhead, adults and jacks of hatchery Chinooks returning in excess to those needed for hatchery brood stock are donated to the Tribes or to local Food Banks.

Broodstock are collected over the entire run period to avoid artificial selection which might change run timing (Lindsay et al. 1989). Spring Chinook for both mitigation program and reintroduction experiments will be captured at the Pelton Trap throughout the spawning run. Approximately 25% of the 1,100 adults for broodstock are transferred to the RBH brood stock ponds during each of the following four time periods: May 1 – June 1; June 2 – 14; June 15 – 30; and July 1 – 31. In most years approximately 70% of the wild run has arrived at WSNFH by June 1 and 90% by July 1. A secondary, smaller peak in migration does occur in late August or early September (Lindsay el al. 1989).

7.3. Identity.

All RBH produced spring Chinook are adipose fin clipped and coded-wire-tagged. Each coded wire tag is read prior to inclusion of their gametes into hatchery production to assure that they are RBH origin fish. All unmarked spring Chinook captured in the Pelton Trap and released into the Deschutes River are marked so they may be recognized

upon recapture. All stray hatchery fish are euthanized and donated to the CTWS-BNR or to local food banks.

Smolts produced at other hatcheries for the reintroduction effort will receive a fin clip – left maxillary clip only - different than those given to RBH production broodstock. Fish that are released as fry and are captured in rotary screw traps, located in the Metolius and Crooked Rivers and Whychus Creek 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 captured at Pelton Trap.

7.4. Proposed number to be collected:

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

Spring Chinook production and reintroduction goals are 310,000 smolts for Deschutes mitigation, 75,000 smolts for Hood River production, and between 430,000 and 738,000 fry for reintroduction. Maximum anticipated program goals are presented in Table 1.11.2. A systematic approach to the selection of spring Chinook salmon broodstock will be used to ensure that the factors such as genetic variability and run timing will be preserved. The base mitigation broodstock requirement is approximately 700 adults (50% female). In support of the Reintroduction program approximately 350 (50% female) additional fish will be retained annually to account for additional production needs. It may be determined by the RBH manager that additional fish are retained due to quality of fish or to offset any potential disease outbreaks (Gauvin and Palmer 2009).

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

The past broodstock collection levels are presented in Table 6.2.2.

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

Under agreement with the CTWS-BNR all fish in excess of broodstock 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 not claimed by either, or carcasses from spawning, pond mortality or culls are buried on Ivan Flat near the PGE Pelton-Round Butte Hydro Maintenance office.

7.6. Fish transportation and holding methods.

All fish captured in the Pelton Trap are anesthetized with CO_2 prior to sorting. Transport of fish returned to the river is via a watered 10” tube with an approximate slope of 30°. Spring Chinook destined for broodstock ponds are given Erythromycin injection at 0.5 ml/fish prior to being 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 O_2 to the fish in transit. The trip from Pelton Fish Trap to the holding ponds is approximately ½ hour.

Distribution to the holding ponds is via a gate valve and trough directly into the holding ponds.

7.7. Describe fish health maintenance and sanitation procedures applied.

A variety of fish health diagnostic and maintenance procedures are applied under supervision of the on-site ODFW fish health specialist assigned to the hatchery. All fish health monitoring will be conducted by the fish health specialist. In some years' spring Chinook are injected with Oxytetracycline to combat bacterial infection from handling. Within three days of transport, all broodstock are treated with 1:6000 formalin solution dripped into one of two brood holding ponds. For three consecutive days after handling, both steelhead and Chinook brood ponds are given a drip treatment of 1:6,000 formalin solution for one hour. Between spawning events, the facility is disinfected. 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, Aquaqmycin 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 will be examined. The number of fish examined will be at the discretion of the fish health specialist. Appropriate actions including use of drug or chemical treatments will be taken as recommended by the specialists. If a bacterial pathogen requires 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 reportable viral pathogens, and samples are taken from 100% of the broodstock. If fish being utilized for production needs are found to be infected with moderate to high levels of BKD or IHN, fertilized eggs of infected fish 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. Occurrence of any abnormal loss of fish will be promptly investigated.

Fish health status is determined prior to release or transfer of fish to another facility. The examination 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. Whenever necessary discussions are conducted pertinent to fish nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures, and treatments etc. and appropriate measures are taken, if necessary. 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 incubation trays or picking tools, the equipment is disinfected with a solution of Argentyne. Each pond or circular tank has its assigned brushes, nets, etc. to minimize cross contamination. To minimize the contamination of eggs with blood, all females are bled by cutting the caudal peduncle. After spawning, the eggs are disinfected

with a treatment of 1:100 mixture of Argentyne and water for 10 minutes. Two to three days after spawning, the eggs are treated with a formalin drip to reduce soft shell disease.

Within the spawning building, each female has her caudal peduncle cut with a modified limb lopper and bleeds on the slab that is in a continuous water wash. Snouts from all adult spring Chinook are read for CWT marking to assure that they are RBH origin fish prior to inclusion of gametes into hatchery production. Each female's eggs are placed in 1-gallon buckets and fertilized by one male. Fertilized eggs are water hardened and disinfected with Argentyne in the incubation room. Samples of amniotic fluid are taken from each female. Kidney and brain core samples from all brood fish are taken for examination for BKD, IHNV, Furunculosis, whirling disease, and other pathogens.

The spawning building is approximately 20'X20' and is equipped with stainless steel tables and racks to facilitate spawning. There is a continuous flow of water over the floor so that blood does not contaminate the concrete. This mix of blood, fish fluids, and water is diluted and exits through a center drain into the hatchery discharge system. Once spawning and sampling are complete, the carcasses are buried on an onsite landfill.

7.8. Disposition of carcasses.

All spawned carcasses are buried in an onsite landfill. As mentioned above, all other carcasses suitable for consumption are donated to CTWS-BNR or food banks. Surplus carcasses not suitable for human consumption are buried.

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

Given the absence of genetic effects to listed steelhead from spring Chinook broodstock collection at RBH, basic safe fish handling techniques at the Pelton Trap during broodstock collection will minimize the ecological impacts on listed wild steelhead.

All RBH broodstock will be sampled for IHN, BKD and other pathogens, as appropriate. Each batch of eggs will be associated with individual fish and be discarded upon the discovery of IHN Type 2 or Whirling Disease.

8. MATING

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

8.1. Selection method.

Ripe spring Chinook for spawning are randomly selected from four different collection periods (see section 7.2). These fish are ponded together and are spawned at random from fish that are ripe on one of two or three spawning days. Coded wire tags from all

potential broodstock are read prior to inclusion into hatchery production to assure that they are of RBH origin.

8.2. Males.

Jacks and 3-year old spring Chinook males are integrated as normal adults into the spawning schedule. An attempt is made to collect a total of 35 jacks (15 jacks from June 2 to June 14, 5 jacks from June 15 to June 30 and 15 jacks from July 1 to July 31).

8.3. Fertilization.

Adults are spawned at 1:1 male to female ratio unless brood shortage of one sex requires otherwise. Fertilized eggs from each female are kept separate and remain identifiable until pathology reports are observed. Eggs taken from BKD and/or IHNV infected parents are destroyed and buried in an onsite landfill.

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 spring Chinook program at RBH. By only spawning spring Chinook known to be of RBH origin, strays are eliminated from the hatchery population, and the flow of out of basin genes into the wild through the RBH program is reduced. However, Warm Springs River's wild stock of spring Chinook has been identified as the priority stock for use in the Reintroduction program. These fish may become available depending on strength of run size and be used after consultation with the CTWS-BNR.

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.

Number of eggs taken in the past and their survival rates at RBH by life stages is presented in Table 9.1.1.

Table 9.1.1. Number of spring Chinook eggs taken and survival rates by life stages at RBH, 1988-2008.

		Survival to Life Stage/Time Frame			
Brood Year	Number of Eggs Taken	Eggs	Fry	Fingerling	Smolts
1988	349,698	64.7%	97.3%	99.1%	99.6%
1989	483,570	88.3%	98.8%	98.8%	99.6%
1990	320,603	86.0%	91.6%	96.9%	99.5%
1991	458,319	82.2%	96.9%	98.0%	99.6%
1992	623,320	87.6%	92.4%	98.3%	99.5%
1993	476,664	89.0%	97.6%	98.5%	98.0%
1994	506,760	91.0%	97.1%	97.6%	97.1%
1995	729,000	93.8%	92.7%	98.5%	94.8%
1996	675,000	88.4%	92.8%	76.1%	97.9%
1997	765,945	92.2%	97.0%	98.4%	95.8%
1998	783,000	96.1%	99.0%	98.8%	98.8%
1999	581,530	98.1%	98.3%	95.1%	98.5%
2000	765,647	92.2%	97.1%	98.1%	90.8%
2001	714,094	83.0%	96.9%	99.1%	97.0%
2002	931,708	94.5%	96.8%	99.0%	94.75%
2003	670,003	92.6%	97.3%	97.6%	96.8%
2004	538,908	93.2%	97.7%	98.5%	99.4%
2005	765,432	95.5%	96.9%	98.9%	99.6%
2006	598,906	98.1%	98.4%	99.2%	98.7%
2007	989,033	96.3%	97.8%	90.7%	97.8%
2008	1,312,760	96.6%	96.1%	97.6%	N/A

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

Extra eggs have been taken whenever possible in order to compensate for the epizootics experienced at RBH over the years. In general, excess eggs are kept until the results of pathology have determined the disease levels of parents, or until culling. Excess eggs and fry are normally buried in an onsite landfill. However in 1981, 1983, 1994, 1995, 2006, 2008 and 2009 excess eggs and or fry were given to WSNFH to supplement the shortfall in their broodstock.

9.1.3. Loading densities applied during incubation.

A maximum of 9,000 spring Chinook eggs are loaded per Heath tray unit. Individual females are separated into mesh bags and two bags are placed in a tray. If an adult is found to have IHNV then the individual bag of eggs can be culled instead of the entire tray. The hatchery has a capacity to incubate 1,287,000 spring Chinook 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.

9.1.4. Incubation conditions.

Incubation water can be chilled at the rate of 50 – 60 gallons per minute from the ambient temperature of 10° C to 5° C. 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 happens. Besides chilling, water can be heated to a maximum or 12.5° C in order to accelerate egg development. This control of temperatures is necessary to achieve a balanced schedule because eggs are spawned over the entire duration of the run. Chilling and heating to different groups of eggs facilitates unifying their rates of embryonic development.

9.1.5. Ponding.

Ponding of spring Chinook is determined by thermal units experienced by the eggs (Table 9.1.5). Fingerlings are ponded when a majority has absorbed their yolk sac. For example, spring Chinook were ponded in February, 2001 at 1,252 fish per pound.

Table 9.1.5. Incubation times required for spring Chinook at RBH (from Nyara 1989)

Species	Incubation temperature (° F)	Days to Shock	Thermal Units	Days to Hatch	Thermal Units	Days to Pond	Thermal Units
Spring Chinook	50	30	540	55	990	80	1440
Spring Chinook	43	50	550	91	101	145	1595
Spring Chinook	42	58	580	99	990	163	1605
Spring Chinook	41	65	585	111	999	180	1620
Spring Chinook	40.75	70	612	113	989	187	1700

9.1.6. Fish health maintenance and monitoring.

A variety of fish health diagnostic and maintenance procedures are applied under the 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, Aquaqmycin 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 drug or chemical treatments will be as

recommended by pathologists. If a bacterial pathogen requires treatment with antibiotics, a drug sensitivity profile will be generated when possible.

Fisheries Society "Fish Health Blue Book" procedures will be followed. Abnormal levels of fish mortality are promptly investigated when they occur. 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. All pertinent issues like nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures, treatments etc. will be discussed and appropriate measures be taken to maintain healthy environment for rearing fish. 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 incubation trays or picking tools, the equipment is disinfected with a solution of Argentyne. Each pond or circular has its assigned brushes, nets, etc. to minimize cross contamination.

All eggs are treated with 1:100 parts of Argentyne for 10 minutes prior to incubation. Additionally, a 1:600 solution of formalin for 10 minutes is applied to the Heath stacks daily until hatching to control soft shell disease and fungal growth. Levels of BKD are analyzed from spring Chinook parents, and the progeny of highest incidence are culled first. Adults are injected with Erythromycin and juveniles are given medicated feed for two 28-day treatment periods. There has been little incidence of coagulated yolk. Egg mortalities are picked with a machine after shocking, and hand picked with tweezers weekly thereafter.

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

This hatchery does not currently incubate listed fish. The incubation of chinook eggs does not have any genetic or ecological effects on listed species.

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 displayed in Table 9.1.1.

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

There are twenty four 6-foot diameter circular tanks that have a maximum loading capacity of 75 lbs at 200 fish/lb for spring Chinook. Actual densities will vary from year to year depending on the number of tanks available at the time. The highest densities experienced at the hatchery Burrows-type ponds have been 3,600 lbs of spring Chinook at 80 fish/lb. Target loading in the spring is 85,000 and 159,000 Chinook fry per pond,

for the Standard and Experimental groups (see Montgomery 2016). In late September, spring Chinook destined to be moved to the Pelton Ladder cells are loaded at a density of 85,000 and 159,000 fish per pond for the Standard and Experimental groups, respectively.

Target rearing densities for spring Chinook juveniles at ponding are 1.2 lb/gal/min and 0.69 lb/ft^3 and 11.83 lb/gal/min and 0.46 lb/ft^3 at releases.

9.2.3. Fish rearing conditions.

Water for all rearing tanks is supplied from leakage from the west-side of Round Butte Dam that maintains a constant temperature of 10°C and has good quality (Table 4.1). Initial rearing is accomplished in the twenty-four 6-ft circular tanks. Water flow is set at 15 gpm and the rate of water rotation in the circular tank is adjusted to a minimum. As the fish grow, the direction of the inflow is changed to increase rate of rotation in order to accommodate different size of fish food. Fish in the circulars are fed a variety of commercial food pellets hourly until fish reach 800-900 fish/lb. These tanks are scrubbed with a brush, and mortalities are picked out and discarded daily.

In March, when they are approximately 350 fish/lb, spring Chinook are moved to the Burrows ponds. This transference is accomplished manually, using barrels that can carry about 50 lbs of fish at a time.

The size of the Burrows ponds is 75 ft X 16.1 ft X 4ftand 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 ponds.

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.

Average monthly fish size for spring Chinook and target size is presented in Table 9.2.4.

Table 9.2.4. Average monthly size (fish/lb) of spring Chinook juveniles at Round Butte Hatchery, 2001-2008 brood year.

	Target Growth	2001BY	2002BY	2003BY	2004BY	2005BY	2006BY	2007BY	2008BY
Ponding	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb
Week 1	1200	1251	1223	1400	1343	1397	1243	1331	1346
Week 2	850	764	447	1060	1139	1000	900	11.75	1200
Week 4	500	287	236	393	936	882	592	692	587
Week 8	236	129	115.6	174	347	320	246	261	172
Week 12	133	65.5	75	98	193	155	123	126	120
Week 16	70.5	42.9	45.9	53.1	112	97	95.1	78	69.2
Week 20	44	37.5	32.5	45.3	64	56.7	59	43.8	38.4
Week 24	33	25.2	24.8	29	44.6	38.4	37.7	30.6	27.7

	Target Growth	2001BY	2002BY	2003BY	2004BY	2005BY	2006BY	2007BY	2008BY
Ponding	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb	fish/lb
Week 28	23.5	20.2	20.1	21.6	30.9	24.1	23.7	20.6	N/A
Week 32	18.5	17.3	19	19.1	19.8	20.8	15.7	16.4	N/A
Week 36	15	16	17.9	17.2	18.2	17.2	13.5	13.6	N/A
Week 40	13.3	14.4	16.8	15.6	16.6	15.2	12.2	13.2	N/A
Week 48	12	13.4	14.7	14.6	15.7	14.5	11.6	12.6	N/A
Release	8	8.6	10.1	9.1	9.5	9.7	8.2	9.5	N/A

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

See Table 9.2.4 above for weekly increase in fish size. The energy reserve data are not available.

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*).

Food types are primarily dry commercial diets from a variety of vendors. The exception to this practice is when spring Chinook fingerlings are fed medicated feed. 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. Fry are fed 6 - 8 times a day, on demand. When spring Chinook reach approximately 200 fish/lb, they are put on a one feeding per day schedule, unless they are on a medicated feeding regimen. Medicated feed is fed at a rate of 2% body weight per day for a 28-day period. After the 28 day feeding regimen, the fish are returned to one feeding per day schedule for 2 weeks, and then the medicated feeding schedule is repeated. At 15 fish per pound, spring Chinook are fed once a week on demand. One month prior to release, they are fed on demand 5 days per week. Estimates of average food conversions are presented in Table 9.2.5.

Table 9.2.5. Average food conversion rates for spring Chinook juveniles at RBH, by brood year (note 66 is the stock code for RBH spring Chinook salmon, followed by the broodyear). An average cumulative conversion of less than 1.0 shows more than one pound of fish growth per pound of food fed.

Chinook Brood Year	Average Cumulative Food Conversion
6697 CHS	1.31
6698 CHS	1.18
6699 CHS	1.08
6600 CHS	.98
6601 CHS	.87
6602CHS	.94
6603CHS	1.04
6604CHS	.91
6605CHS	1.06

Chinook Brood Year	Average Cumulative Food Conversion
6606CHS	.97
6607CHS	.93

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.

The migratory state or smoltification is determined by age, color, size, behavior, and physical appearance of fish. No gill ATPase enzyme activities are measured.

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

Five cells of the Pelton Ladder are used to rear spring Chinook from 15 fish per pound to smoltification**.** The Pelton Ladder rearing strategy is more fully described Section 1.5 (pages 3-4). As part of the reintroduction plan, unfed and fed fry will be released into the upper watershed and allowed to rear in the natural environment; they will be captured and released downstream during their smolt migration.

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.

No listed fish are used in this propagation program.

10. RELEASE

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

10.1. Proposed fish release levels.

Spring Chinook releases from RBH are anticipated to be 310,000 smolts for the mitigation program and 430,000 unfed/fed fry for the reintroduction program (see Table 1.11.2). The fish that are raised at the facility for the HRPP are not released from RBH the specific locations and release levels are identified in the Hood River HGMP.

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

Smolts Releases for Deschutes River spring chinook Mitigation Program:

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

Reintroduction into Deschutes River (fry: fed and unfed):
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 into Whychus Creek (fry: fed and unfed):
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 into Crooked River (fry: fed and unfed):
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

Reintroduction into Metolius River (fry: fed and unfed):
Stream, river, or watercourse: Metolius 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.

Actual release numbers for the 1986 to 2008 release years are presented in Table 1.12a (See Attachment 1).

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

Actual release dates for the 1986 to 2003 release years are presented in Table 1.12a (Attachment 1).

Spring Chinook are allowed to emigrate from the Pelton Ladder rearing area of their own volition. Release occurs as orifice (porthole) gates are opened to each of the ladder cells and smolts migrate out of the ladder unrestricted. Current release dates are based on evaluations of release time on survival and are timed to occur when *Ceratomyxa shasta* levels are low. In mid-April, Deschutes stock spring Chinook smolts have demonstrated both behavioral and physiological readiness to migrate and move out of the Pelton Ladder quickly (Smith and CTWS 1991).

10.5. Fish transportation procedures, if applicable.

For the mitigation fish, there is a 30-45 minute transit from RBH to the Pelton Ladder. From RBH, fish densities for transportation follow IHOT recommendations for spring

Chinook pre-smolts to ladder which is 0.9 lbs/gal. No temperature control required for the short transit from RBH to ladder. Oxygenation is provided by oxygen tanks and recirculation pumps.

For the reintroduction fish, the transport time for the fry releases varies by location. Currently, the fish are placed into mesh bags and placed into insulated transport trucks. The fish are transported in oxygenated and re-circulated water. The density in the bags is about 4000 fry per bag. The weight of the fish varies from release event to release event due to the prolific growth of the fry, typically the weight ranges from 650 to 900 fish per pound. The fish are transported to the various release locations and placed in the stream. Fish are acclimated to the stream temperature and released in small groups into appropriate habitat. In some cases, the stream reaches are not located along a road. In these situations, the fish are placed into large plastic bags which are then filled with pure oxygen and transported in backpacks into the remote locations.

10.6. Acclimation procedures (methods applied and length of time).

The Pelton Ladder is an adult fishway extending from below Pelton Regulating Dam upstream to the Pelton Dam. The 10 feet-wide, 6 feet-deep, 2.8 mile-long ladder was originally designed and constructed to allow passage of adult Chinook salmon and summer steelhead around the Pelton-Round Butte Project. The ladder was abandoned as an adult passage facility after juvenile passage at Round Butte Dam was deemed inadequate (Smith and CTWS 1991).

The Pelton Ladder was modified and put to use as a rearing and acclimation site for juvenile spring Chinook in the late 1970's. Juvenile spring Chinook are moved by truck from ponds at RBH to the individual ladder cells in November to rear over winter. Juveniles are separated in these serial rearing cells by means of gated orifices and rotary drum screens positioned directly upstream from gated walls separating each rearing cell (Pribyl et al. 1997). After about 4-5 months of acclimation/rearing into ladder cells spring Chinook are allowed to migrate from the Pelton Ladder rearing area of their own volition during the month of April. In approximately the middle of April, the porthole gates are opened; at this time feeding is suspended to encourage fish out migration. On June 1st, the gates are closed and any remaining fish are culled and euthanized.

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

RBH spring Chinook for the mitigation program are 100% adipose-clipped and coded wire tagged to identify fry rearing origin (rearing cell) of returned adults for evaluation purposes.

To differentiate reintroduction fish from other fish in the Deschutes basin, we determined that a differential mark is warranted. We will be using a left maxillary clip for the smolts reared at other hatcheries and a right maxillary clip for the naturally reared smolts. We will not be removing the adipose fins. The objective of marking the fish in this way is so that returning reintroduction fish can be differentiated from the Round Butte Hatchery

mitigation fish. This identifying mark will assist hatchery staff during collection of adults at the Pelton trap. Fish originating from above the project can be segregated and passed above the project while mitigation adults can be transported to the hatchery. 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.

The only fish identified as "surplus" at the time of release are those remaining in the fish ladder rearing cells after an allowed period of volitional migration. Past treatment of these non-migrants has varied, and in some years they have been removed and buried, and some years these fish have been forced released. In the future, non-migrants remaining after a period of volitional migration will be sampled for the rate of mini-jack development. If this sampling shows greater than a 10% rate of mini-jacks in the entire group, then the entire group of non-migrants will be destroyed rather than force released from the ladder rearing cells.

10.9. Fish health certification procedures applied pre-release.

Fish health at pre-release is inspected by ODFW Pathologist 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, a 440 ft 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. Should there be a complete system failure, those fish in captivity will likely be killed by the subsequent catastrophic event.

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.

Ecological interactions between spring Chinook and the listed summer steelhead and bull trout is minimized by volitional releases of program fish while they are full-term smolts that will outmigrate quickly to the ocean.

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.

Refer to Section 1.10 of this document for a description of plans and methods proposed to collect the data necessary to evaluate each "Performance Indicator" identified.

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 fund all programs associated with its license requirements including such monitoring and evaluation as agreed to by the parties to ensure meeting the goals of the hatchery program. PGE has consistently demonstrated a serious commitment to providing the resources needed for successful implementation of the 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. Additionally, all hatchery produced eggs/fry excess to the program goals is destroyed, and adults are donated to the Tribes or food banks.

12. RESEARCH

In the recent past, ODFW Pathology has been conducting studies to provide a disease risk assessment associated with the passage of fish over the Project (Engelking 2002; in preparation). Additionally, OSU Microbiology has been conducting surveys to determine the level of risk associated with *Mxyobolus cerebralis* and *Ceratomyxa Shasta* and fish passage (Bartholomew 2002; Sollid et al. 2001).

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. On an annual basis the Licensees must submit an annual work plan, part of which describes in detail the T&V objectives and results.

12.1. Objective or purpose.

Restoring passage above the Pelton Round Butte Project has been recommended by a Fisheries Committee consisting of representatives of USFWS, BIA, USFS, BLM, NOAA, DEQ, the Tribes, NGOs, ODFW and PGE. Following NWPCC goals of doubling anadromous fish runs in the Columbia Basin, fish passage at Pelton Round Butte Project is considered advantageous.

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, NGOs, PGE and the Tribes.

12.3. Principle investigator or project supervisor and staff.

Principal Investigator: Rod French, District Fish Biologist
Research/Monitoring Staff: Brett Hodgson, Terry Shrader, and PGE staff members Don Ratliff and Megan Hill.

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

Stock and stock status are as described in Section 2, above.

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/redband 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. PGE will not be able to evaluate Objectives 2 and 3 in 2015 because Chinook fry will not be outplanted. These objectives will resume in 2016 when Chinook fry are anticipated to be available.

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/redband 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; releases are scheduled to continue for the foreseeable future. Five sites sampled were chosen to represent the range of habitats available in Whychus Creek (Lewis 2003) and because pre-reintroduction redband 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 Wolftree property (Reach 5; rkm 25).

McKay Creek

Reintroduction of steelhead fry began in McKay Creek in 2008; additional releases are scheduled to continue for the foreseeable future. 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 exclosure.

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, Wolftree 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.

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/redband 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. PGE will not be able to evaluate Objectives 2 and 3 in 2015 because Chinook fry will not be outplanted. These objectives will resume in 2016 when Chinook fry are anticipated to be available.

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/redband 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; releases are scheduled to continue for the foreseeable future. Five sites sampled were chosen to represent the range of habitats available in Whychus Creek (Lewis 2003) and because pre-reintroduction redband 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 Wolftree property (Reach 5; rkm 25).

McKay Creek
Reintroduction of steelhead fry began in McKay Creek in 2008; additional releases are scheduled to continue for the foreseeable future. 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 exclosure.

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, Wolftree 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.

<u>Study Sites</u>
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 the fourth consecutive year in 2015, in conjunction with upstream passage of adult salmon and steelhead into LBC. Specific objectives of the Adult Migration T&V Study are to determine: migration timing, spawning distribution, spawning abundance, interspecific and intraspecific competition and survival to spawning for adult *O. mykiss* (steelhead), *O. tshawytscha* (Chinook) and *O. nerka* (sockeye) released upstream of the Project.

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)**:

<u>Pelton Adult Fish Trap Operations</u>
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.

<u>Sample Size</u>

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, CO_2, 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".

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.

12.13. See 12.5

13. ATTACHMENTS

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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: Brett Hodgson, Deschutes Watershed District Manager

Signature of Applicant: _____ Date: _____

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature: _____ Date: _____

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). 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 effects of the RBH spring chinook program on bull trout populations in the Deschutes River is unknown but is believed to be small.

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 Spring 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 and RBH spring chinook 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 spring chinook spawning.

As discussed above, RBH has a track record of releasing full term, migration ready spring chinook smolts that migrate quickly through the lower Deschutes

and likely have little opportunity to interact with adult bull trout present there. The possibility for disease transfer between the two groups is unknown but thought to be limited since RBH smolts are not released unless they have received disease clearance from ODFW pathologists. It is possible that adult bull trout may use RBH spring chinook smolts as a prey base, potentially a benefit for the bull trout from this chinook propagation program.

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 extremely low.

Table A.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

Year	Month Captured	Number Captured
2010		29
2011		14
2012		51
2013		109
2014		14
2015		32
2016		13

A.4) <u>Actions taken to minimize potential effects.</u>

Operation of the RBH spring chinook program is thought to have a minor 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 until information suggests modifications will better protect bull trout.

A.5) <u>References for Addendum A.</u>

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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: Deschutes River, RM 100 **Dates of activity: January through December** **Hatchery program operator: ODFW and PGE**				
	Annual Take of Listed Fish By Life Stage ***(Number of Fish)***			
Type of Take	**Egg/Fry**	**Juvenile/ Smolt**	**Adult**	**Carcass**
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			1 1 0	
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, incl. loss during transport, holding prior to spawning , 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 1.12a. Spring Chinook releases into the Lower Deschutes River from Round Butte Hatchery by Brood Year.

Brood Year	Released Year	Release Date(s)	Rearing Location	Fin Mark / CWT	Fish per Pound	Release Number
1984	1986	3/12/1986	Pond	73320	5.7	62,952
		3-11/612-86	Ladder	73321	7.7	62,994
		3-11/612-86	Ladder	LVLM	7.7	66,593
		3-11/612-86	Ladder	LP	7.7	74,364
1985	1987	4/13/1987	Pond	73928	5.5	54,863
		5/27/1987	Ladder	RP	7.5	75,000
		5/27/1987	Ladder	73929	7.5	62,000
		5/27/1987	Ladder	RVRM	7.5	74,000
1986	1988	4-11/12-88	Pond	74461	6.9	54,221
		4-11/-25-88	Ladder	LVLM	8.3	74,364
		4-11/-25-88	Ladder	74462	8.3	61,270
		4-11/-25-88	Ladder	LP	8.3	74,364
1987	1989					
		4-17/18-89	Pond	74622	7.3	28,186
		4-17/18-89	Pond	74623	6.4	29,528
		4-18/5-4-89	Ladder	74624	9.5	20469
		4-18/5-4-89	Ladder	74625	9.3	20410
		4-18/5-4-89	Ladder	74626	10.6	20453
		4-18/5-4-89	Ladder	RM	9.8	153,868
1988	1990	4-19/20-90	Pond	75061	6.3	29,590
		4-19/20-90	Pond	75062	6.3	28,608
		4-23/510-90	Ladder	75058	9.7	24,107
		4-23/510-90	Ladder	75059	9.7	20,967
		4-23/510-90	Ladder	75060	9.7	21,328
		4-23/510-90	Ladder	LM	9.7	134,847
1989	91	4-22/23-91	Pond	75361	6.1	29959
		4-22/23-91	Pond	75362	6.1	29959
		4-15/5-10-91	Ladder	75363	9.5	21236
		4-15/5-10-91	Ladder	75401	9.5	21232
		4-15/5-10-91	Ladder	75402	10.5	21521
		4-15/5-10-91	Ladder	RM	9.8	146,985
1990	1992	20-Apr	Pond	75648	6.5	28,575

Brood Year	Released Year	Release Date(s)	Rearing Location	Fin Mark / CWT	Fish per Pound	Release Number
		20-Apr	Pond	75649	6.5	28,575
		4-20/5-21	Ladder	LM	9.8	149,548
		4-20/5-21	Ladder	75645	9.8	21,148
		4-20/5-21	Ladder	75646	9.8	21,590
		4-20/5-21	Ladder	75647	9.8	21,393
1991	1993	7-Apr	Pond	078008r2	6.1	24,735
		5-Apr	Lower ladder	75940	8.7	21,122
		5-Apr	Lower ladder	75949	8.7	47,713
		6-Apr	Middle ladder	75939	10	22,020
		6-Apr	Middle Ladder	75948	10	49,600
		7-Apr	Upper Ladder	75947	9.8	49,127
		7-Apr	Upper Ladder	75938	9.8	21589
1992	1994	18-Apr	Pond	70230	6	26,580
		6-May	Upper Ladder	70227	8.6	70,995
		6-May	Middle Ladder	70228	9.3	70,960
		6-May	Lower Ladder	702290	8.9	68,998
1993	1995	17-Apr	Pond	70529	5.8	29,318
		4-17/5-16	Upper Ladder	70526	8.7	69,446
		4-17/5-16	Middle Ladder	70527	8.7	70,042
		4-17/5-16	Lower Ladder	70528	8.1	70,413
1994	1996	25-Apr	Pond	70938	10.7	19,239
		25-Apr	Pond	70936	7.9	25,680
		25-Apr	Lower Ladder	70935	7.3	65,625
		22-Apr	Middle Ladder	70933	7.8	63,475
		23-Apr	Upper Ladder	70934	8.3	63,536
		24-Apr	Cell 6	70938	10.9	85,151
		25-Apr	Cells 4 and 5	71130	9.5	7,592
1995	1997	12-Apr	Pond	91744	6.5	15,061
		12-Apr	Pond	91745	11	26,280
		16-Apr	Ladder cell 1	91742	7.3	61,995
		17-Apr	Ladder cell 2	91741	7.3	61,732
		18-Apr	Ladder cell 3	71746	11	92,208
		25-Apr	Ladder cell 6	91743	8	63,418
1996	1998	13-Apr	Pond	92223	8.6	16,397

Brood Year	Released Year	Release Date(s)	Rearing Location	Fin Mark / CWT	Fish per Pound	Release Number
		13-Apr	Pond	92224	12	31,699
		20-Apr	Ladder cell 1	92220	9	60,145
		21-Apr	Ladder cell 2	92221	8	63,213
		23-Apr	Ladder cell 3	92225	11	96,633
		23-Apr	Ladder cell 6	92222	10	64,149
1997	1999	4-12/5-10	Ladder cell 1	92551	7.8	71,195
		4-13/5-10	Ladder cell 2	92552	7.5	72,275
		4-14/5-10	Ladder cell 3	92553	7.7	79,511
		4-15/5-10	Ladder cell 6	92554	7.1	80,840
1998	2000	4-18/5-9	Ladder cell 1	92851	8.1	82,130
		4-49/5-9	Ladder cell 2	92852	8.5	82,584
		4-20/5-9	Ladder cell 3	92853	7.2	82,938
		4-20/5-9	Ladder cell 6	92854	7.4	51,142
1999	2001	4-16/5-10	Ladder cell 1	93119	8.4	82,139
		4-17/5-10	Ladder cell 2	93118	8.1	59,406
		4-18/5-10	Ladder cell 3	93117	7.8	82,072
		4-19/5-10	Ladder cell 6	93116	8.7	77,600
2000	2002	4/15/2002	Ladder cell 1	93318	9.6	71,711
		4/16/2002	Ladder cell 2	93319	9.7	68,263
		4/17/2002	Ladder cell 3	93317	10.5	83,292
		4/18/2002	Ladder cell 6	93316	9.6	83,194
2001	2003	4/17/2003	Ladder cell 1	93550	7.4	83,675
		4/14/2003	Ladder cell 2	93551	9.1	83,693
		4/15/2003	Ladder cell 3	93552	8.5	84,475
		1/3/1900	Ladder cell 6	93553	9.7	84,709
2002	2004	3/30/2004	Ladder cell 1	93847	9.8	84,735
		4/5/2004	Ladder cell 2	93848	10.1	83,523
		4/12/2004	Ladder cell 3	93849	10.7	85,477
		4/19/2004	Ladder cell 6	93850	9.6	82,674
2003	2005	4/4/2005	Ladder cell 1	94042	8.3	80,467
		4/5/2005	Ladder cell 2	94043	9.6	78,945
		4/11/2005	Ladder cell 3	94044	8.9	79,404
		4/11/2005	Ladder cell 6	94045	9.7	74,112

Brood Year	Released Year	Release Date(s)	Rearing Location	Fin Mark / CWT	Fish per Pound	Release Number
2004	2006	4/12/2006	Ladder cell 1	94222	10.1	42,490
		4/12/2016	Ladder cell 2	94223	10.1	42,799
		4/13/2006	Ladder cell 3	94224	8.4	42,543
		4/13/2006	Ladder cell 6	94225	8.4	42,582
		4/17/2006	Ladder cell 1	94226	10.2	42,604
		4/17/2006	Ladder cell 2	94227	10.2	42,610
		4/19/2006	Ladder cell 3	94228	9.2	97,794
		4/19/2006	Ladder cell 6	94229	9.2	37,885
2005	2007	4/12 - 6/1/07	Ladder cell 1	94440	9.2	83,892
		4/16-6/1/07	Ladder cell 2	94441	10.4	83,937
		4/17-6/1/07	Ladder cell 3	94442	9.6	84,033
		4/19-6/1/07	Ladder cell 6	94443	9.8	84,161
2006	2008	4/14-6/1/08	Ladder cell 1	94618	7.6	61,307
		4/15-6/1/08	Ladder cell 2	94619	10.4	61,397
		4/17-6/1/08	Ladder cell 3	94620	9	62,237
		4/21-6/1/08	Ladder cell 6	94621	8.3	48,081

Table12.1.a ends

Attachment 2:

Table 1.12b. Recoveries of RBH coded wire tagged spring Chinook by brood year. In river recoveries only. Harvest data expanded. Does not include mini-jacks (2 yr old)

Brood Year	Release Year	Harvest Year	Harvest Age	CWT Code	In-Deschutes Harvest			Pelton Trap	WSNFH Trap	Total Deschutes Recoveries
					Sport	Tribal	Total Harvest			
2001	2003	2004	3	93550	18	0	18	67	0	85
2001	2003	2004	3	93551	9	0	9	67	0	76
2001	2003	2004	3	93552	17	0	17	62	1	80
2001	2003	2004	3	93553	10	0	10	83	0	93
2001	2003	2005	4	93550	11	0	11	301	0	312
2001	2003	2005	4	93551	11	3	14	333	0	347
2001	2003	2005	4	93552	18	2	20	353	0	373
2001	2003	2005	4	93553	21	0	21	379	0	400

Brood Year	Release Year	Harvest Year	Harvest Age	CWT Code	In-Deschutes Harvest			Pelton Trap	WSNFH Trap	Total Deschutes Recoveries
					Sport	Tribal	Total Harvest			
2001	2003	2006	5	93550	0	0	0	11	2	13
2001	2003	2006	5	93551	0	0	0	14	0	14
2001	2003	2006	5	93552	0	0	0	12	0	12
2001	2003	2006	5	93553	0	0	0	15	0	15
2002	2004	2005	3	93847	1	1	2	77	0	79
2002	2004	2005	3	93848	0	0	0	44	0	44
2002	2004	2005	3	93849	0	0	0	43	0	43
2002	2004	2005	3	93850	0	0	0	48	0	48
2002	2004	2006	4	93847	0	2	2	331	3	336
2002	2004	2006	4	93848	0	0	0	201	2	203
2002	2004	2006	4	93849	0	0	0	245	1	246
2002	2004	2006	4	93850	0	0	0	241	0	241
2002	2004	2007	5	93847	0	0	0	9	0	9
2002	2004	2007	5	93848	0	1	1	3	0	4
2002	2004	2007	5	93849	1	0	1	5	0	6
2002	2004	2007	5	93850	0	0	0	10	0	10
2003	2005	2006	3	94042	0	0	0	97	0	97
2003	2005	2006	3	94043	0	0	0	94	0	94
2003	2005	2006	3	94044	0	0	0	127	0	127
2003	2005	2006	3	94045	0	0	0	134	1	135
2003	2005	2007	4	94042	13	1	14	193	0	207
2003	2005	2007	4	94043	8	1	9	172	0	181

Brood Year	Release Year	Harvest Year	Harvest Age	CWT Code	In-Deschutes Harvest			Pelton Trap	WSNFH Trap	Total Deschutes Recoveries
					Sport	Tribal	Total Harvest			
2003	2005	2007	4	94044	15	2	17	229	0	246
2003	2005	2007	4	94045	22	1	23	166	0	189
2003	2005	2008	5	94042	0	0	0	0	0	0
2003	2005	2008	5	94043	0	0	0	0	0	0
2003	2005	2008	5	94044	0	0	0	3	0	3
2003	2005	2008	5	94045	0	0	0	3	0	3
2004	2006	2007	3	94222	3	0	3	65	0	68
2004	2006	2007	3	94223	0	0	0	43	2	45
2004	2006	2007	3	94224	0	0	0	55	0	55
2004	2006	2007	3	94225	2	0	2	60	0	62
2004	2006	2007	3	94226	0	0	0	56	1	57
2004	2006	2007	3	94227	0	0	0	46	0	46
2004	2006	2007	3	94228	0	0	0	89	0	89
2004	2006	2007	3	94229	0	0	0	48	0	48
2004	2006	2007	3	94230	2	0	2	25	1	28
2004	2006	2007	3	94231	0	0	0	30	1	31
2004*	2006	2008	4	94222	8	0	8	92	0	100
2004*	2006	2008	4	94223	6	0	6	81	0	87
2004*	2006	2008	4	94224	12	0	12	133	0	145
2004*	2006	2008	4	94225	10	0	10	98	1	109
2004*	2006	2008	4	94226	4	0	4	71	0	75
2004*	2006	2008	4	94227	4	0	4	65	0	69
2004*	2006	2008	4	94228	7	0	7	70	0	77
2004*	2006	2008	4	94229	5	0	5	55	0	60
2004*	2006	2008	4	94230	1	0	1	40	0	41
2004*	2006	2008	4	94231	2	0	2	39	0	41

Brood Year	Release Year	Harvest Year	Harvest Age	CWT Code	In-Deschutes Harvest			Pelton Trap	WSNFH Trap	Total Deschutes Recoveries
					Sport	Tribal	Total Harvest			
2004	2006	2009	5	94222	No Sport	0		1	0	1
2004	2006	2009	5	94223	Fishery	0		2	0	2
2004	2006	2009	5	94224		0		4	0	4
2004	2006	2009	5	94225		0		0	0	0
2004	2006	2009	5	94226		0		0	0	0
2004	2006	2009	5	94227		0		1	0	1
2004	2006	2009	5	94228		0		0	0	0
2004	2006	2009	5	94229		0		0	0	0
2004	2006	2009	5	94230		0		0	0	0
2004	2006	2009	5	94231		0		1	0	1
2005*	2007	2008	3	94440	11	0	11	228	0	239
2005*	2007	2008	3	94441	11	0	11	141	0	152
2005*	2007	2008	3	94442	9	0	9	137	0	146
2005*	2007	2008	3	94443	13	0	13	156	0	169
2005	2007	2009	4	94440	No Sport	0	0	264		264
2005	2007	2009	4	94441	Fishery	0	0	269	0	269
2005	2007	2009	4	94442		0	0	216	0	216
2005	2007	2009	4	94443		0	0	258	0	258
2005	2007	2010	5	94440	N/A	N/A		N/A	N/A	
2005	2007	2010	5	94441	N/A	N/A		N/A	N/A	
2005	2007	2010	5	94442	N/A	N/A		N/A	N/A	
2005	2007	2010	5	94443	N/A	N/A		N/A	N/A	
2006	2008	2009	3	94618	No Sport	0	0	863	0	863

Brood Year	Release Year	Harvest Year	Harvest Age	CWT Code	In-Deschutes Harvest			Pelton Trap	WSNFH Trap	Total Deschutes Recoveries
					Sport	Tribal	Total Harvest			
2006	2008	2009	3	94619	Fishery	0	0	698	0	698
2006	2008	2009	3	94620		0	0	807	0	807
2006	2008	2009	3	94621		0	0	621	0	621
2006	2008	2010	4	94618	N/A	N/A		N/A	N/A	
2006	2008	2010	4	94619	N/A	N/A		N/A	N/A	
2006	2008	2010	4	94620	N/A	N/A		N/A	N/A	
2006	2008	2010	4	94621	N/A	N/A		N/A	N/A	
2006	2008	2011	5	94618	N/A	N/A		N/A	N/A	
2006	2008	2011	5	94619	N/A	N/A		N/A	N/A	
2006	2008	2011	5	94620	N/A	N/A		N/A	N/A	
2006	2008	2011	5	94621	N/A	N/A		N/A	N/A	

* - Preliminary Data ends.

Table 1.12b

Attachment 3

Table 1.12c. Smolt to adult survival statistics for RBH spring Chinook by brood year.

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
1984	1986	Pond	73320	62,952	638	1.01%	
		Ladder	73321	62,994	685	1.09%	
		Ladder	LVLM	66,593	684	1.03%	
		Ladder	LP	74,364	514	0.69%	
		Total		266,903	2,521		0.94%
1985	1987	Pond	73928	54,863	638	1.16%	
		Ladder	RP	75,000	418	0.56%	
		Ladder	73929	62,000	837	1.35%	
		Ladder	RVRM	74,000	596	0.81%	
		Total		265,863	2,489		0.94%

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
1986	1988	Pond	74461	54,221	464	0.86%	
		Ladder	LVLM	74,364	1,147	1.54%	
		Ladder	74462	61,270	1,207	1.97%	
		Ladder	LP	74,364	643	0.86%	
		Totals		264219	3,461		1.31%
1987	1989	Pond	74622	28,186	348	1.23%	
		Pond	74623	29,528	300	1.02%	
		Ladder	74624	20,469	259	1.27%	
		Ladder	74625	20,410	241	1.18%	
		Ladder	74626	20,453	213	1.04%	
		Ladder	RM	153,868	1,655	1.08%	
		Totals		272,918	3,016		1.11%
1988	1990	Pond	75061	29,590	197	0.67%	
		Pond	75062	28,608	375	1.31%	
		Ladder	75058	24,107	435	1.80%	
		Ladder	75059	20,967	325	1.55%	
		Ladder	75060	21,328	307	1.44%	
		Ladder	LM	134,847	2,186	1.62%	
		Totals		259,442	3,825		1.47%
1989	1991	Pond	75361	29,959	265	0.88%	
		Pond	75362	29,959	206	0.69%	
		Ladder	75363	21,236	175	0.82%	
		Ladder	75401	21,232	162	0.76%	
		Ladder	75402	21,521	91	0.42%	
		Ladder	RM	146,985	953	0.65%	
				270,892	1,852		0.68%
1990	1992	Pond	75648	28,575	54	0.19%	
		Pond	75649	28,575	69	0.24%	
		Ladder	75645	21,147	57	0.27%	
		Ladder	75646	21,540	72	0.33%	
		Ladder	75647	21,393	45	0.21%	
		Ladder	LM	149,458	307	0.21%	
			Totals	270,688	604		0.22%
1991	1993	Pond	078008r2	24,735	163	0.66%	

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
		Lower Ladder	75940	21,122	59	0.28%	
		Lower Ladder	75949	47,713	133	0.28%	
		Middle Ladder	75939	22,020	53	0.24%	
		Middle Ladder	75948	49,600	217	0.44%	
		Upper Ladder	75947	49,127	120	0.24%	
		Upper Ladder	75938	21,589	51	0.24%	
			Totals	235,906	796		0.34%
1992	1994	Pond	70230	26,580	2	0.01%	
		Upper Ladder	70227	70,995	288	0.41%	
		Middle Ladder	70228	70,960	388	0.55%	
		Lower Ladder	702229	68,998	385	0.56%	
			Totals	237,533	1,063		0.45%
1993	1995	Pond	70529	29,318	23	0.08%	
		Upper Ladder	70526	69,446	74	0.11%	
		Middle Ladder	70527	70,042	51	0.07%	
		Lower Ladder	70528	70,413	73	0.10%	
				239,219	221		0.09%
1994	1996	Pond	70938	19,239	53	0.28%	
		Pond	70936	25,680	9	0.04%	
		Lower Ladder	70935	65,625	73	0.11%	
		Middle Ladder	70933	63,475	60	0.09%	
		Upper Ladder	70934	63,536	83	0.13%	
		Cell 6	70938	85,151	53	0.06%	
		Cells 4 and 5	71130	7,592	0	0.00%	

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
			Totals	330,298	331		0.10%
1995	1997	Pond	91744	15,061	71	0.47%	
		Pond	91745	26,280	121	0.46%	
		Ladder cell 1	91742	61,995	118	0.19%	
		Ladder cell2	91741	61,732	216	0.35%	
		Ladder cell 3	71746	92,208	352	0.38%	
		Ladder cell 6	91743	63,418	67	0.11%	
			Totals	320,694	945		0.29%
1996	1998	Pond	92223	16,397	93	0.57%	
		Pond	92224	31699	189	0.60%	
		Ladder cell 1	92220	60,145	127	0.21%	
		Ladder cell2	92221	63,213	70	0.11%	
		Ladder cell 3	92225	96,633	27	0.03%	
		Ladder cell 6	92222	64,149	45	0.07%	
			Totals	332,236	551	0.17%	0.17%
1997	1999	Ladder cell 1	92551	71,195	639	0.90%	
		Ladder cell2	92552	72,275	600	0.83%	
		Ladder cell 3	92553	79,511	651	0.82%	
		Ladder cell 6	92554	80,840	513	0.63%	
			Totals	303,821	2403	0.79%	0.79%
1998	2000	Ladder cell 1	92851	82,130	2198	2.68%	
		Ladder cell2	92852	82,584	1854	2.24%	
		Ladder cell 3	92853	82,938	1927	2.32%	

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
		Ladder cell 6	92854	51,142	968	1.89%	
			Totals	298,794	6947		2.33%
1999	2001	Ladder cell 1	93119	82,139	1155	1.41%	
		Ladder cell2	93118	59,406	861	1.45%	
		Ladder cell 3	93117	82,072	968	1.18%	
		Ladder cell 6	93116	77,600	738	0.95%	
			Totals	301,217	3722		1.24%
2000	2002	Ladder cell 1	93318	71,711	137	0.19%	
		Ladder cell2	93319	68,263	85	0.12%	
		Ladder cell 3	93317	83,292	16	0.02%	
		Ladder cell 6	93316	83,194	43	0.05%	
			Totals	306,460	281		0.09%
2001	2003	Ladder cell 1	93550	83,675	410	0.49%	
		Ladder cell2	93551	83,693	437	0.52%	
		Ladder cell 3	93552	84,475	465	0.55%	
		Ladder cell 6	93553	84,709	508	0.60%	
			Totals	336,552	1820		0.54%
2002	2004	Ladder cell 1	93847	84,735	424	0.50%	
		Ladder cell 2	93848	83,523	251	0.30%	
		Ladder cell 3	93849	85,477	295	0.35%	
		Ladder cell 6	93850	82,674	299	0.36%	

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
			Totals	336,409	1269		0.38%
2003	2005	Ladder cell 1	94042	80,467	304	0.38%	
		Ladder cell 2	94043	78,945	275	0.35%	
		Ladder cell 3	94044	79,404	376	0.47%	
		Ladder cell 6	94045	74,112	327	0.44%	
			Totals	312,928	1282		0.41%
2004	2006	Ladder cell 1	94222	42,490	169	0.40%	
		Ladder cell 2	94223	42,799	134	0.31%	
		Ladder cell 3	94224	42,543	204	0.48%	
		Ladder cell 6	94225	42,582	171	0.40%	
	WSNFH 10204	Ladder cell 1	94226	42,604	132	0.31%	
	WSNFH 10204	Ladder cell 2	94227	42,610	116	0.27%	
	WSNFH 10204	Ladder cell 3	94228	97,794	166	0.17%	
	WSNFH 10204	Ladder cell 6	94229	37,885	108	0.29%	
			Totals	391,307	1200		0.31%
2005	2007	Ladder cell 1	94440	83,892	N/A		
		Ladder cell 2	94441	83,937	N/A		
		Ladder cell 3	94442	84,033	N/A		
		Ladder cell 6	94443	84,161	N/A		
			Totals	336,023			N/A
2006	2008	Ladder cell 1	94618	61,307	N/A		

Brood Year	Release Year	Rearing Location	Fin Mark or CWT Code	Number Released	Deschutes Recoveries a/	Group % Survival	BY % Survival
		Ladder cell 2	94619	61,397	N/A		
		Ladder cell 3	94620	62,237	N/A		
		Ladder cell 6	94621	48,081	N/A		
			Totals	233,022			N/A
a/ Represents all in-Deschutes recoveries in fisheries and hatchery traps.							

Table 1.12c. ends.