Chinook Salmon

PacifiCorp plans to capture and transport tule Chinook salmon to the hatchery during the first year following dam removal. However, under all but the most optimistic recovery scenarios, the river will not be able to fully support Chinook spawning and egg incubation for between 3 and 20 years following dam removal. The Draft SEIS conclusion that "*trapping and hatchery rearing one year-class appears to address the concern for that species*" (Page 1-10) is not supported by any facts or meaningful analysis. The Draft SEIS further contradicts itself when it points out that previous to construction of Condit Dam the majority of Chinook salmon production occurred in the lower 2.6 miles of river and "*This section of the river would not experience significant recruitment and production of Chinook and chum salmon until spawning gravels become established and free of fines in approximately 3 to 5 years*." (Page 4.3-20). A6-44

Chum Salmon

The chum salmon population above Bonneville dam is currently limited to less than 200 individuals (Lower Columbia Fish Recovery Board 2004).[10] It is unknown what percentage of these remaining Upper Gorge chum salmon spawn in the White Salmon River. The Draft SEIS states: "*The species of likely greater concern is the Columbia River chum salmon. It is probably not feasible to trap them for hatchery rearing, and it may not be feasible to restore suitability in the following year to their spawning gravel unless storm flows in the White Salmon River are particularly suitable*". Under Significant Unavoidable Adverse Impacts the Draft SEIS concludes that one year-class of chum salmon would be lost immediately as the dam is breached and several year classes would be lost due to long term effects of habitat impairment. These claims are based on the best case (least impact) sediment movement scenario. The Draft SEIS fails to consider the results of more conservative estimates of potential habitat impacts on chum salmon. Chum salmon have historically spawned in the lower 1.2 miles of the White Salmon River. Deposition in this area is expected to be over 5 feet deep and consist almost entirely of fine grained silt and sand unsuitable for salmonid spawning. It is optimistic to expect habitat quality will return to normal within a few years. The continual loss of a percentage of the already small chum population could jeopardize the Upper Gorge run. A6-45

A second chum salmon related impact not considered is the potential impact to populations of chum salmon that spawn in the mainstem Columbia River near Multnomah Falls and Ives Island immediately downstream of Bonneville Dam and the recently discovered mainstem spawning population along the Washington shores near the I-205 Glen Jackson Bridge. In section 4.2.4 of the Draft SEIS it notes that sediment levels in the mainstem Columbia from breaching the dam will be elevated all the way to the mouth of the Columbia River. With peak turbidity levels likely to occur during the chum A6-46

[10] Lower Columbia Fish Recovery Board. 2004. Lower Columbia salmon recovery and fish & wildlife subbasin plan. http://www.lcfrb.gen.wa.us/December%20Final%20%20Plans /lower_columbia_salmon_recovery_a.htm. December 15, 2004.

A6-44

The river and the lower portions of some tributaries would be able to fully support Chinook salmon spawning and egg incubation at, or above, current levels during the year following dam removal. The river below the dam is expected to contain higher than current levels of available spawning habitat for Chinook salmon within 3 to 5 years after dam breaching. Additional spawning and rearing habitat for Chinook salmon would become available in the reservoir reach within this time period.

A6-45

Currently, only two chum salmon have been documented to enter the White Salmon River. It is not known if these fish successfully spawned, and they represent stray fish from a population below Bonneville Dam. Although a few hundred chum salmon have been documented to pass over Bonneville Dam during some years, successful spawning by any of these fish has not been documented. These fish have the potential to eventually reestablish a population in the White Salmon River if suitable habitat is available. Very little suitable habitat is available at this time, but the removal of Condit Dam is expected to provide a substantial increase in suitable spawning substrates and spawning habitat area within 5 years. Based on 20 years of post-eruption research of stream habitat recovery in streams draining from Mount St. Helens (Bisson et al. 2005), a 5-year estimate is conservative and not at all optimistic.

A6-46

The increase in suspended sediments in the Columbia River below Bonneville Dam immediately following dam breaching may reach levels of 1,100 to 2,600 ppm (PacifiCorp 2005). After the initial 6 hours, anticipated concentrations are expected to drop to 100 to 750 ppm (PacifiCorp 2005). After approximately the first week, sustained concentrations of suspended sediments would be at background levels, with brief spikes in concentrations over the first month (PacifiCorp 2005). Dam breaching is expected to occur over a month before chum salmon spawning occurs in the location cited in this comment (Ehlke and Keller 2003), and levels of suspended sediments would be at essentially background levels with no effect on spawning chum salmon or incubating eggs in gravel.

salmon spawning and egg incubation season, population impacts could be significantly higher than predicted. A6-46 Continued

Coho Salmon

Coho populations in the lower Columbia River are heavily influenced by hatchery releases and it is reported that a number of local populations of coho salmon in the area have become extinct (Lower Columbia Fish Recovery Board 2004). Other populations are considered depressed (Olsen et al. 1992).[11] The Lower Columbia River coho salmon population has only recently been listed as threatened (70 FR 37160). Coho salmon in the White Salmon River typically spawn from October through January. This will coincide with the period of highest turbidity after breaching the dam. The complete loss of one or more year classes of coho salmon was not identified as a Significant Unavoidable Adverse Impacts in the Draft SEIS. No mitigation for these losses is proposed. A6-47

Bull Trout

We can find no discussion of the Significant Unavoidable Adverse Impacts likely to occur to the small bull trout population in the Draft SEIS, 1996 FERC Final EIS, or 2002 FERC Final SFEIS. The impacts appear to have been dismissed based on the fact that very few specimens remain in the system. This fact should generate a higher level of concern for the remnant population, not dismissal. The adfluvial population of bull trout is likely to be decimated by the proposed dam removal option whereas a more measured approach to sediment removal and drawdown would have a better chance of protecting individual fish. A6-48

3.2. Underestimated Aquatic Habitat Impacts

Because the high sediment transport duration period is so critical to potential lethal and sublethal fisheries impacts, the SEPA requirement for an "*impartial discussion*" requires critical review for a longer duration of impacts than those predicted by PacifiCorp. A reasonably expected sediment transport duration that the Draft SEIS should have examined includes up to a decade of high bedload movement and episodic pulses of significant suspended sediment, for the reasons described in this letter. While the Draft SEIS recognizes that "*the longer the sediment takes to exit the reservoir, the greater the impacts on water quality and aquatic organisms*" (Page 1-13), the evaluation contained in the Draft SEIS is based on only one scenario consisting of a relatively short-term and "best case" habitat disruption. A6-49

While the predicted impact scenario results in rapid mortality to all existing fish, macro-invertebrates, and aquatic insects within the White Salmon River downstream of the dam, the predicted long-term benefits to regional fisheries resources, upon which the value of the entire project is predicated, are based on an extremely optimistic sediment regime recovery. Various habitat components of the river are predicted in the Draft SEIS to A6-50

[11] Olsen, E., P. Pierce, and K. Hatch. 1992. Stock summary report for Columbia River anadromous salmonids. Prepared for the US DOE, BPA. DOE/BP-94402-1.

A6-47

Coho are primarily tributary spawners, with only limited mainstem spawning in larger rivers. None of the spawning habitat available below the dam is suitable for coho salmon and the White Salmon River does not currently support any documented populations of coho salmon (Good et al. 2005).

A6-48

Impacts to bull trout are discussed in Chapter 4.3.2 of the FSEIS. Only two bull trout have ever been reported above the dam and both were captured in the reservoir behind the dam. Extensive surveys of the watershed above the dam have not documented any bull trout spawners or juvenile bull trout. If any bull trout remain in the watershed above the dam, it is below the levels of detection. No reproducing population of bull trout is below the dam and the occasional adult bull trout observed in the White Salmon River below the dam represent foraging migratory bull trout from other watersheds (i.e. Hood River). Chapter 4.3.2 of the FSEIS states that all fish present below the dam would likely be killed by high levels of suspended sediments immediately after dam breaching. Bull trout are present, but extremely rare in the Bonneville pool and its tributaries, even in the Hood River, which has the only known reproducing bull trout populations in Bonneville Pool tributaries. Because adult bull trout would have returned to their natal streams before dam breaching in October, it is unlikely that any would be present in the lower White Salmon River when the dam is breached or enter the river until levels of suspended sediment subside. Since there is documented suitable spawning and rearing habitat for bull trout in the White Salmon River above Condit Dam, dam removal would permit recolonization of the White Salmon River by bull trout and result in a long-term beneficial impact to bull trout in the White Salmon River watershed. Also, please see response to Comment A6-41.

A6-49

The Bank Stabilization Plan in the Project Description (PacifiCorp 2004) outlines steps to be taken to remove unstable sediment that is not scoured out by river action. If this plan is implemented, there is no reason to

expect a decade of high bedload and significant suspended sediment pulses. West coast salmonids evolved in and are adapted to a stream environment with episodic pulses of sediment. Studies in streams impacted by the eruption of Mount St. Helens have shown that salmonid populations can and do quickly return to predisturbance levels in the presence of episodic pulses of sediment after a major debris and sediment event (Bisson et al. 2005). Also, please see responses to Comments A6-20 and A6-31.

A6-50

The DSEIS estimates are based on information published after the release of the original FERC estimates, and the citations are appropriate. Estimates that functional spawning habitat would be available within 1 to 2 years is based on available information. Following the 1980 eruption of Mount St. Helens, many fishery managers predicted that the recovery of aquatic organisms and salmonid populations would take decades, as riverine habitats had been extensively damaged. Major sections of the Mount St. Helens volcano rushed downslope as debris flows into the Toutle River and its tributaries. These debris flows dwarfed any possible release of sediments from behind Condit Dam. The two major Toutle River tributaries (South Fork Toutle River and Green River) eroded through mudflow or tephra-fall deposits and returned to preeruption streambeds within a few years (Bisson et al. 2005). Suitable spawning gravel should be present in the White Salmon River within a few years. The estimate in the DSEIS of one to three years for recovery of spawning gravels is consistent with the recovery of larger streams in the Toutle River basin following the eruption of Mount St. Helens.

Returning adult salmon and steelhead were scarce for the first 3 years after the eruption (Lieder 1989). Peak suspended sediment concentrations of 1,770,000 mgLl were recorded in the Toutle River and were often greater than 10,000 mg/L for several years after the eruption, yet some adult steelhead returned to the river during the first year after the eruption (Bisson et al. 2005). Mudflows continued in the Toutle River system for many years following the 1980 eruption. Numbers of steelhead redds (egg deposition sites) observed in the mainstem of the south fork of the

Toutle River rose from 0 in 1980 to an average of 5.7 redds/km in 1984 and further to 21.5 redds/km in 1987 (Lucas and Pointer 1987).

After an initial population crash due to direct mortality from debris flows, exposure to high temperatures, and levels of suspended sediments, a rapid posteruption rebound in primary productivity, aquatic and terrestrial invertebrate populations, and rearing salmonid populations occurred (Bisson et al. 2005). Within 2 to 3 years, productivity and the abundance of invertebrates and rearing fish reached preeruption levels and by 5 years, productivity and abundances exceeded preeruption levels. A gradual return to the range of preeruption abundance occurred after the initial spike in abundance, with a return to the natural range approximately 15 years after the eruption (Bisson et al. 2005).

return to a functional condition within 1 to 2 years based primarily on the level of fine material returning to pre-existing conditions. Significant recruitment of Chinook and chum salmon is predicted for between 3 and 5 years post dam removal. These estimates are based on inappropriate citations (Beschta and Jackson 1979[12] and Bash *et al.* 2001[13]), and reliance on an overly optimistic view of sediment transport rates following dam removal. Even the FERC (2002 Draft SFEIS) estimated a period of between 2 and 7 years before salmon habitat in the lower White Salmon River would become productive and usable for spawning and rearing.

A6-50 Continued

The Draft SEIS has cited Beschta and Jackson (1979) and Bash *et al.* (2001) to support the original PacifiCorp contention that spawning gravel quality for salmonids will return to normal within one to two years of dam breaching. However, a review of these two documents fails to find any support for this assumption. Bash *et al.* (2001) is a summary of publications that have reviewed effects of turbidity and suspended sediment on salmonids. The only reference to stream gravel sedimentation found that fine sediment (<0.83mm) levels in gravels remained at elevated levels for 3 years after being impacted (Smedley *et al.* 1970).[14] This was in reference to fine sediment levels of six to eight percent rather than the 90+ percent expected for the White Salmon River. Beschta and Jackson (1979) used laboratory studies to analyze the movement of fine sediments into stream gravels. The author's primary interest was in sediment aggradation, not gravel cleaning. Only in an ancillary run of the test flume did they qualitatively examine fine sediment flushing with the conclusion that bed movement needs to occur before fines can be removed. The authors also noted that "*the direct application of these results to natural streams is tenuous.*"

A6-51

A more plausible disturbance regime following dam removal consists of between 5 and 10 years of potentially lethal episodic turbidity impacts. Should landslides occur as described in Section 2, it would be decades to centuries before sediment transport rates and the percentage of fine material create potentially useful salmonid spawning habitat in the lower river. Under the landslide scenario, it could be decades to centuries before upstream fish migration is possible through the former reservoir site to the upper river area.

A6-52

Until the river returns to a functional system, any fish entering the White Salmon River system risks suffering significant lethal or sub-lethal exposure to pulses of high turbidity. Approximately 1.6 million cubic yards of very fine sediment (<0.25 mm) are stored

A6-53

[12] Beschta, R.L., Bilby, R.E., Brown, G.W., Holtby, L.B., and T.D. Hofstra. 1987. Stream temperature and aquatic habitat: Fisheries and forestry interactions. *In* Salo, E.O and T.W. Cundy [eds.] Streamside Management: Forestry and Fishery Interactions. University of Washington, College of Forest Resources, Seattle, Washington. 471p.

[13] Bash, J., C. Berman, and S. Bolton. 2001. Effects of turbidity and suspended solids on salmonids. Prepared for the Washington State Department of Transportation, Olympia, Washington, by the University of Washington Center for Streamside Studies, Seattle, Washington.

[14] Smedley, S.C., K.E. Durleg, C.C. Larson, D. Bishop, W.L. Sheridan, and F. Stephens. 1970. ADF&G completion report – projects 5-8-R and 5-19-R; July 1, 1965 to June 30, 1970. Alaska Department of Fish and Game, Juneau. 82 p.

A6-51

Very little experimental data are available that are completely applicable to natural streams. The references cited were some of the best available. Deposition of fine sediment between gravel particles is a natural process that happens in riverbeds. The spikes in sediment concentration in the White Salmon River described in Section 4.1 Geology, Soils and Sediment, subsection Flood Scouring, are related to potential major floods that would provide sufficient movement of bedload sediments to mitigate the plugging of gravels by fine sediment. The predicted spikes in sediment concentration after five years are considered minor compared to the amount of natural sediment carried by the river during flood stage. Additional references from Bisson et al. (2005), Lucas and Pointer (1987) and Lieder (1989) concerning the effects of fines in a natural stream system have been added to the FSEIS.

A6-52

Implicitly, this comment continues to make the incorrect assumption of long-term mass wasting as observed at Teton Dam. As discussed in Section 4.1 Geology, Soils and Sediments in the FSEIS, there would be unstable sediments once the dam is removed and those unstable sediments from any source would be removed, this would minimize long-term impacts. The example of long-term mass wasting observed at Teton Dam is inappropriate when applied to the White Salmon River Canyon.

The reservoir canyon upstream of Teton Dam is located in a steppe/shrub environment with very little vegetative cover to anchor soils. Although both the Teton and White Salmon River Canyons have cliffs of volcanic rock present, their geological histories and morphologies are quite different. The rim of the Teton River Canyon is surrounded by irrigated fields. In addition, the Teton River Canyon has a much wider floodplain than the White Salmon River Canyon, which is largely composed of basalt cliffs. The Teton River Canyon has extensive terraces of loose soil that are poorly anchored by vegetation. There are far fewer terraces present in the White Salmon River Canyon and they are covered with both conifer and hardwood forests, which help to stabilize the underlying soil.

As for the sediments deposited in the lake bed, the major objective of dam removal is to rapidly drain the sediments into the river canyon below

Condit Dam and release any terraces of loose sediments that remain as quickly as possible until they reach a stable angle of repose. Remaining soil would be revegetated to stabilize it (this was not practical in the high desert of the Teton River Canyon). The wider floodplain of the Teton River Canyon allowed more lateral migration of the river channel, which undercut sediment deposits, than would be possible in the narrower White Salmon River Canyon.

Using the Teton Dam failure as an analog for sediment transport phenomenon at Condit Dam ignores differences in bedrock strength, distribution of surficial deposits, and hydraulic differences between the two sites. The strong nature of the bedrock in the area of Condit Dam is evidenced by the narrow bedrock channels present downstream of the dam and the steep bedrock cliffs evident in pre-dam photographs. The relative lack of surficial deposits surrounding the Condit reservoir is related to the steep river gradient, the steep topography surrounding the White Salmon River in the reservoir area, and the size and geologic characteristics of the drainage basin. All of these factors make the situation at Condit Dam substantially different from the margins of the former Teton reservoir where river terraces and other low shear strength surficial deposits are common. Also, many of the more than 200 landslides that occurred at Teton Dam were induced when the reservoir filled rather than during and after the failure. The continuing blockage of the Teton River channel with slide debris related to the dam failure retards sediment transport, providing yet another difference between the two sites. As a mitigation measure, PacifiCorp has agreed to dislodge unstable sediment once the drawdown has been completed. Removal of unstable sediment is not limited to reservoir sediment.

A6-53

Section 4.3 of the DSEIS and FSEIS includes a reasonable scenario addressing the effects to fish from high suspended sediments following the breaching of the dam. Fish present below the dam and most of the fish present in the reservoir are expected to be killed by lethal levels of sediment in the period immediately following dam removal. Some may be displaced to the Bonneville pool. The effects would be relatively short-term in comparison to those of Teton Dam, which occurred in a wide

behind the existing dam (DR Gathard & Associates 1998). Very fine sediments produce turbidity that can have a detrimental effect on fish communities. High turbidity can impact fish directly through changes in behavior and physiology, or indirectly by decreasing food supply and habitat availability. Behavioral modifications include cessation of feeding, reduced disease resistance, and outmigration. Physical reactions include excessive mucus secretion, excretory interference and respiratory complications (Redding et al., 1987).[15] Under a reasonable scenario not evaluated in the Draft SEIS, the White Salmon River could become a lethal trap for regional salmonids including both adult and juvenile drop-ins, fish looking for thermal refuge, and strays searching for new spawning habitat.

A6-53 Continued

Fine sediments would enter the river through increased bank erosion along the five miles of unstable channel, soil creep and mass wasting events in the old reservoir site. Work to stabilize the reservoir and remove woody debris would increase delivery rates of fine sediment. Sediment analysis of the material stored behind the dam showed that approximately 94 percent of the material or about 2.2 million cubic yards of material with a particle size less than 1.00 mm are stored behind the dam (DR Gathard & Associates 1998). Fine sediments can have detrimental effects on salmonid spawning success if heavy sedimentation of gravels occurs during the spawning and incubation period (Chapman, 1988;[16] Tappel and Bjornn, 1983[17]). Peterson et al. (1992)[18] conducted a review of the available scientific literature and concluded survival and development of embryos and growth of alevins can be reduced if fine sediment size fractions exceed approximately 12 percent by weight of the total sample volume. If levels exceed 17 percent, spawning is considered degraded (Washington Forest Practices Board 1997).[19] Given the abundance of fine material stored behind the dam, and a less than optimal release rate during dam removal, habitat conditions in the lower White Salmon River could preclude spawning for all salmonid species for well more than the 3 to 5 years predicted in the Draft SEIS. This could have a particularly severe impact on listed fall Chinook and chum salmon which historically have spawned downstream of the dam.

A6-54

Over time, patches of clean gravel would appear and present spawning opportunities for both resident trout and salmon. However, eggs deposited in these areas would have a high risk of being buried by the above average frequency of moving bedload or pulses of entrained fine sediment. Because salmon spawn only once before dying and a number of federally listed species may utilize the river, the loss of potential recruitment could be significant. Only a few hundred chum salmon pass Bonneville Dam and an unknown

[15] Redding, J.M., C.B. Schreck and F.H. Everest. 1987. Physiological effects of coho salmon and steelhead of exposure to suspended solids. Trans. Am. Fish. Soc. 116:737-744.
[16] Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Trans. Am. Fish. Soc. 117:1-21.
[17] Tappel, P. D. and T. C. Bjornn. 1983. A new method of relating size of spawning gravel to salmonid embryo survival. North Am. J. of Fish Manag. 3:123-135.
[18] Peterson, N.P., A. Hendry, and T.P. Quinn. 1992. Assessment of cumulative effects on salmonid habitat: some suggested parameters and target conditions. Final Report TFW-F3-92-001.
[19] Washington Forest Practices Board. 1997. Board manual: standard methodology for conducting watershed analysis, Version 4.0. Washington Department of Natural Resources, Forest Practices Division. Olympia.

floodplain with extensive terraces of loose soil that are poorly anchored by vegetation. There are far fewer terraces present in the White Salmon River Canyon, and they are covered with both conifer and hardwood forests, which help to stabilize the underlying soil. West coast salmonids evolved in and are adapted to a stream environment with episodic pulses of sediment. Studies in streams impacted by the eruption of Mount St. Helens have shown that salmonid populations can and do quickly return to predisturbance levels in the presence of episodic pulses of sediment after a major debris and sediment event (Bisson et al. 2005).

A6-54

Currently, only two chum salmon have been documented to enter the White Salmon River. It is not known if these fish successfully spawned, and they represent stray fish from a population below Bonneville Dam. Although a few hundred chum salmon have been documented to pass over Bonneville Dam during some years, successful spawning by any of these fish has not been documented. These fish have the potential to eventually reestablish a population in the White Salmon River, if suitable habitat is available. Very little suitable habitat is available at this time, but the removal of Condit Dam is expected to provide a substantial increase in suitable spawning substrates and spawning habitat area within 5 years.

Deposition of fine sediment between gravel particles is a natural process that happens in riverbeds. The spikes in sediment concentration in the White Salmon River described in Section 4.1 Geology, Soils and Sediment, subsection Flood Scouring, are related to potential major floods that would provide sufficient movement of bedload sediments to mitigate the plugging of gravels by fine sediment. The predicted spikes in sediment concentration after five years are considered minor compared to the amount of natural sediment carried by the river during flood stage. Additional references from Bisson et al. (2005), Lucas and Pointer (1987) and Lieder (1989) concerning the effects of fines in a natural stream system and recovery of fish populations have been added to the FSEIS.

percentage are believed to spawn in the White Salmon. The Draft SEIS provides no analysis regarding the potential long term loss of chum salmon due these proposed increases in sediment movement.

A6-54 Continued

It is reasonable to expect that conclusions regarding future spawning habitat availability are also overestimated. While it is true that the presence of Condit Dam has blocked downstream recruitment of sediment for more than 90 years, and removal would restore normal bedload movement, PacifiCorp's sediment analysis of the material stored behind the dams indicates spawning sized substrate is virtually non-existent. Only 2.3 percent of the material is greater than 4mm in size (0.25 inches) (DR Gathard & Associates 1998). Much of this is likely to settle out in the deep pools currently found in the reach one mile downstream of the dam when the dam is removed. Over 94 percent of the material is of the size that is considered detrimental to spawning habitat (Washington Forest Practices Board 1997).

A6-55

Fine sediments can also seasonally collect in pools, low-gradient reaches and along margins of channels throughout the stream network (Peterson *et al.*, 1992; Lisle and Hilton, 1992[20]). Such sedimentation can reduce the summer and winter rearing capacity of streams by filling pools, embedding substrates and decreasing food production capabilities. All salmonid and many non-salmonid species would be affected to some extent by such sedimentation. Availability of thermal refuge in the lower river would be significantly affected for a far longer period than predicted in the Draft SEIS.

3.3. Thermal Refuge

The Draft SEIS cites "*New thermal refuge habitat for migrating Columbia River anadromous salmonids in the White Salmon River*" (Page 4.3-22) as one beneficial effect of dam removal. The basis for this claim is: 1) reduced stream temperatures due to removal of the reservoir warming effect, and, 2) access to newly available habitat upstream of the former dam site. When examined in more detail, neither of these effects will come close to replacing the quality of thermal refuge habitat that will be lost as the pool at the mouth of the river is filled.

A6-56

All of the SEPA analyses agree the large pool at the mouth of the river will be filled by sediments now stored behind the dam if the proposed dam removal plan is implemented. Measures to minimize/mitigate loss of the pool include requesting Bonneville Dam operators to lower the Bonneville Pool when the Condit Dam is breached, and contribution of funds to the Yakama Nation for fishery enhancement (though not required to be for White Salmon River enhancement). Implementation of these measures are outside the control of PacifiCorp so they are speculative at best and should not be relied on when evaluating reasonable assurance for mitigating thermal refuge after dam removal.

A6-57

[20]Lisle, T., and S. Hilton. 1992. The volume of fine sediment in pools: An index of sediment supply in gravel bed streams. Water Res. Bull. 28:371-383.

A6-55

Although most of the sediment behind the dam is fine sediment, most of the fines would be flushed into the Bonneville pool. There is a century's worth of transported gravel bedload collected behind the dam (primarily in the upper portion and tributary arms of the reservoir). The river transport of some of this gravel to the lower river following dam breaching and continued transport of gravel in the years following dam removal would provide far more spawning gravel area than is currently present in the river below Condit Dam.

A6-56

The removal of the reservoir's warming effect was not considered a replacement for the thermal refuge currently present in the river below the dam. However, thermal refuge habitat above the reservoir would provide an immediate short-term replacement (as soon as suspended sediment levels drop in the spring following dam breaching) for thermal refuge below the dam. As deposited sediment is cleared from the reservoir reach and the pools below the dam by the high energy levels of the steep gradient river channel, additional refuge habitat, exceeding the current amount, would become available within a few years following dam removal.

A6-57

These measures are not required in order to maintain thermal refuge. See response to Comment A6-56.

PacifiCorp assertions that "*thermal refuge in the White Salmon River will not be lost, but will change location*" is speculative at best and should not be relied on to reduce the potential severity of impacts to juvenile fish. Under a reasonable set of circumstances less optimistic than the proposed outcome suggested by the applicant, vast quantities of sediment will slowly move through the bypass reach and in-lieu site for many years. Pool quality will suffer and thermal refuge habitat could be non-existent. Adult steelhead are the only species likely to use thermal refuge upstream of RM 5 and there is no basis to claim that more than a few fish will migrate up past the highly activate erosional area for many years. In no circumstance would this habitat replace the high quality pool habitat currently found at the mouth of the White Salmon River.

Page 2-4 of the Draft SEIS proposes the thermal refuge habitat loss would be compensated in part by *"cooler water"* after dam removal. There is no supporting information that confirms the water will be significantly colder, or how much colder, or how any temperature difference could mitigate for lost thermal refuge pool habitat near the river mouth. It does not appear from prior data that elimination of the reservoir will create cool temperatures suitable for thermal refuge where they did not occur prior to dam breaching, so the temperature difference cannot make up for physical thermal refuge habitat lost to sediment fill by the project. Page 4-3 of the Final EIS (October 1996) says that the forebay was 0.6°C warmer than the tailrace and raceway range of 11.2-14.7°C during the summer, and that the reservoir does not stratify. These temperatures are cool enough to provide thermal refuge to fish migrating up the Columbia. There is no analysis in the Draft SEIS indicating how much cooler water without the impoundment may be, but Page 4.3-22 of the Draft SEIS characterizes it as a *"small increase in water temperature below Condit Dam from the discharge of warmed reservoir surface water."* It is a weak argument that slight cooling of water (already cold enough with the reservoir in place to afford thermal refuge for Columbia River migrants) offsets the loss of thermal habitat as a rationale for not providing adequate thermal refuge mitigation. A6-58

The Draft SEIS suggests the presence of 16 additional miles of accessible thermal refuge will be available for anadromous salmonid use following removal of the dam. This claim ignores several facts including:

- the most valuable three miles of this habitat in the lower river are already available to salmon;
- the most significant adverse habitat impacts as a result of dam removal will be to the lower three miles of river including permanent filling of most of the pools currently used as thermal refuge; A6-59
- a permanent barrier to salmonid migration near RM 2.6 already precludes juvenile fish from migrating upstream past this point in search of additional thermal refuge so no new benefits will be available to the most vulnerable lifestage of fish;
- large woody debris accumulations in the canyon reach between approximately RM 2.0 and RM 5.0 may have historically precluded salmon from migrating upstream past this area (discussed elsewhere in this letter);
- a permanent barrier to salmonid migration near RM 8 (Husum Falls) already precludes salmonids other than steelhead and possibly Chinook from migrating upstream past this point; and

A6-58

Thermal refuge in the White Salmon River and other tributary rivers of the Columbia River represent refuge from elevated water temperatures present in the mainstem of the Columbia River, not temperatures present in the White Salmon River. River temperatures below the dam site would be slightly cooler after dam removal, but the pools present in the White Salmon River below the dam are already sufficiently cool to provide thermal refuge from elevated water temperatures in the Bonneville pool. The statement that thermal refuge would change location is a reference to the conversion of the pool at the mouth of the White Salmon River to a stream channel (with additional spawning gravel area). As the high energy of the steep gradient river channel removes fines from the river channel, which is presently buried by the reservoir, and pools in the river below the dam, which would be partially filled by fines after dam breaching, additional thermal refuge habitat would become available to anadromous salmonids. This refuge would far exceed what is currently available.

A6-59

The DSEIS and FSEIS do not ignore any of the important facts when it states that there would be 16.2 miles of accessible thermal refuge available for anadromous salmonids. The DSEIS does not state there would be 16 additional miles of thermal refuge. The 16.2 miles of thermal refuge would include the lower 3 miles of river below the dam. Most of the pools present below the dam would not be permanently filled. The pool at the mouth of the river would be mostly converted to stream channel, but the other pools would be partially filled with fines for several years until the high energy force of the high-gradient stream channel transports the fines to the Bonneville pool. The falls at RM 2.6 is a barrier to juvenile salmonid upstream migration, not adult migration. Thermal refuge in the White Salmon River refers to adult anadromous salmonids in the mainstem Columbia River entering the White Salmon River to avoid elevated water temperatures in the Columbia River, not to juvenile salmonids. The height of Husum Falls was significantly reduced during construction of a bridge shortly after the completion of the dam. Husum falls is no longer a significant obstacle for anadromous salmonids

- it is likely to be many more years than predicted before habitat conditions reach the point where fish actually start to migrate into the White Salmon River in search of refuge habitat.

A6-59 Continued

The area below Condit Dam is currently designated critical habitat for a variety of listed salmonid runs based in part on the availability of crucial juvenile and adult salmonid thermal refuge habitat. Critical habitat includes the entirety of the pool near the mouth of the White Salmon. Removal of the dam in the proposed manner will adversely modify one type of critical habitat required for many listed species to migrate upstream and downstream past the site or in the case of bull trout, to survive in the Columbia River during the summer.

A6-60

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993).[21] One of these requirements is relatively cold water temperatures in comparison to other salmonids, particularly summer water temperatures. As noted in the proposal to list critical habitat for bull trout (69 FR 35768) "*In large rivers, bull trout are often observed ''dipping'' into the lower reaches of tributary streams, and it is suspected that cooler waters in these tributary mouths may provide important thermal refugia, allowing them to forage, migrate, and overwinter in waters that would otherwise be, at least seasonally, too warm.*". One of the Primary Constituent Elements determined essential to the conservation of bull trout is "*Water temperatures ranging from 36 to 59 °F (2 to 15 °C), with adequate thermal refugia available for temperatures at the upper end of this range*" (69 FR 35768). The proposed action will arguably diminish the availability of thermal refugia for bull trout thus potentially violating take prohibitions of the Endangered Species Act. In any case, impacts to listed species should be identified as a significant adverse effect under SEPA with concomitant mitigation requirements or denial of state permits.

A6-61

3.4. Fish Passage

Documents prepared as part of the *Project Description* include a Canyon and Woody Debris Management Plan (PacifiCorp 2004). Within this plan is a proposal to identify accumulations of woody debris in the canyon reach downstream of the dam, evaluate potential fish migration barriers associated with the debris, and move or remove the offending pieces.

A6-62

Woody debris in streams provides channel structure, helps trap and stabilize coarse gravel deposits, creates scour for pool development, provides overhead and stream velocity cover for fish, influences stream bank characteristics, and provides habitat for invertebrates (Bisson et al., 1987;[22] Beschta et al., 1987; Bilby and Ward, 1991[23]). Large

[21] Rieman, B.E. and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. USDA Forest Service, Intermountain Research Station. General Technical Report INT-302

[22] Bisson, P.A. Bilby, R.E. Bryant, M.D. Dolloff, C.A., Grette, G.B., House, R.A. Murphy, M.L., Koski,K.V. and J.R. Sedell. 1987, p. 87-94. *In* Salo, E.O and T.W. Cundy [eds.] Streamside Management: Forestry and Fishery Interactions. University of Washington, College of Forest Resources, Seattle, Washington. 471p.

and was probably never more than a partial barrier. The large accumulations of large wood debris that were historically present before the dam are not likely to be duplicated under present or future conditions and did not preclude salmon from migrating upstream. Similar logjams occurred near the forks of the Skagit River and many other northwestern rivers and never precluded upstream or downstream salmon migration. The reasons why the projected length of time until habitat is useable is sound have been addressed in responses to comments A6-19, A6-22, and other responses above.

A6-60

The FSEIS recognizes that critical habitat for several species of salmonids would be adversely modified in the short term. It also recognizes that these adverse modifications would be short term and that long-term impacts to the habitat would be beneficial and miles of additional habitat would be made accessible to salmonids. In the case of chum salmon, the beneficial modifications would occur long before a reproducing population becomes established and may be necessary for the establishment of a viable chum salmon population on the White Salmon River. The same statement can be made for bull trout and coho salmon. Long-term benefits to steelhead and Chinook salmon habitat would far exceed the short-term modification of steelhead and Chinook salmon habitat.

A6-61

Thermal refuge from elevated temperatures in the Bonneville pool is not necessary for bull trout during the period following dam breaching to when suspended sediment levels fall to levels that permit the migration of bull trout to the upper watershed. Migratory bull trout are primarily present in the lower Columbia River mainstem and White Salmon River during the Chinook salmon smolt out-migration when bull trout enter the Columbia River mainstem and lower White Salmon River to forage. By October, migratory (fluvial) bull trout have returned to their natal streams to spawn and would not return to the mainstem or tributary rivers until a smolt out-migration occurs. As soon as the upper White Salmon is accessible to migrating bull trout, they would have access to miles of watershed above the dam site for thermal refuge, spawning, and juvenile

woody debris is regarded as a critical fish-habitat-forming feature in streams and offers considerable channel stability and diversity functions as well (Bisson et al. 1987; Sullivan *et al.* 1987).[24]

The presence of large amounts of woody debris was documented in the confined section of the White Salmon River channel immediately upstream of the Condit Dam site during construction of the dam (2004 White Salmon Subbasin Plan). There are historical recollections from the period 1907-1910 of a logjam in the river, "*probably 500 feet upstream of the location of Condit Dam and extending for 0.5 mile, with an estimated 20 million board feet in the jam*". There is a pre-dam photo of this area showing some of the wood accumulations in the Condit *Project Description*, Appendix 9 (PacifiCorp 2004). It is reasonable to assume conditions were at times similar in the confined canyon reach downstream of Condit Dam.

Once Condit Dam is removed, woody debris is again likely to accumulate in the canyon reaches upstream and downstream of the dam site, and may cause natural fish blockages as has likely occurred periodically for tens of thousands of years. Woody debris moves episodically with high flow events and major landslides. Natural woody debris torrents expected after breaching of the dam will not be any different in this respect with events that have occurred in the past. Yet PacifiCorp proposes to remove the woody debris to help fish migrate upstream.

A6-62 Continued

In their *Project Description* (Page 1) PacifiCorp has stated "*Removing the dam will open approximately 19 miles of potential river habitat to spawning steelhead and salmon, and will restore connectivity to foraging, spawning, rearing and overwintering habitat for bull trout in the lower White Salmon River.*" PacifiCorp and several of the SEPA documents list this as justification for impacts caused by removal of the dam. As wood removal using techniques such as blasting and heavy equipment (as is discussed in the plan) is not a natural occurrence, the only reason PacifiCorp has for proposing to remove the wood is to support the habitat extension benefits justifying their project. The Draft SEIS does not critically evaluate claims for increased habitat availability made by PacifiCorp. Any salmonid habitat benefits claimed as justification should be eliminated until this review is complete.

A6-63

We think there is potential for serious impacts to the environment if PacifiCorp is allowed to remove woody debris from the river as is proposed. Hydraulic permits would be required from the Washington State Department of Fish and Wildlife who has policies against the removal of wood from streams. The Draft SEIS does not address whether there are any significant impacts from proposed woody debris removal plan.

A6-64

[23] Bilby, R.E. and J. W. Ward. 1991. Characteristics and function of large woody debris in streams draining old growth, clear-cut, and second growth forests of southwestern Washington. Can. J. of Fish. Aquat. Sci., 48:1-10.

[24] Sullivan, K., T.E. Lisle, C.A. Dolloff, G.E. Grant and L.M. Reid. 1987. Stream Channels: The Link Between Forests and Fishes. p. 143-190. In: Salo, E.O. and T.W. Cundy [eds.] Streamside Management: Forestry and Fishery Interactions. University of Washington, College of Forest Resources. Seattle, Washington. 471 p.

rearing. Foraging bull trout present in the Bonneville pool during the smolt out-migration is likely less than a hundred fish and there are sufficient tributary streams with suitable thermal refuge for the number of bull trout likely to be present in the Bonneville pool. Because adult bull trout would have returned to their natal streams before dam breaching, it is unlikely that any would be present in the lower White Salmon River when the dam is breached or enter the river until levels of suspended sediment subside. Additionally, most bull trout observations in the Bonneville pool occur where large releases of salmon smolts occur, such as the hatchery near the mouth of the Little White Salmon River. The USFWS Biological Opinion provides for incidental take of bull trout.

A6-62

Management of the aquatic resources is the responsibility of the applicable state and federal agencies. Management of woody debris (both whether to remove it and how to do so) would be coordinated with those agencies and not subject to unilateral actions.

A6-63

The trade-offs between short-term impacts and long-term benefits have been discussed for years, and the existence of the Settlement Agreement is evidence that the trade-offs have been deemed worthwhile by all of the signatory entities. Specific actions concerning woody debris are only to accomplish the long-term benefits and would be done with the approval of the appropriate agencies that have responsibility for the resources. There is no "claimed justification" to be eliminated.

A6-64

See response to Comment A6-62.