STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

February 12, 2009

Mr. Tom Dresser
Manager, Fish, Wildlife and Water Quality
Grant County Public Utility District
P.O. Box 878
Ephrata, WA 98823

Dear Mr. Dresser:

RE: Request for Comment – January 2009 Pacific Lamprey Management Plan, License Article 401(a)(12)

The Department of Ecology (Ecology) has reviewed the Final Pacific Lamprey Management Plan received on February 2, 2009, and APPROVES this plan.

Please feel free to contact me at (509) 329-3450 or by email at dman461@ecy.wa.gov if you have any further questions regarding this matter.

Sincerely,

D. Marcie Mangold

D. Marcie Mangold
Water Quality Program

DMM:dw
cc: Gerry O'Keefe, Grant PUD
Mike Clement, Grant PUD
Bill Tweit, WDFW
Brian Faller, Ecology/ATG
James M. Bellatty, Ecology/WQP

Grant County
PUBLIC UTILITY DISTRICT
Excellence in Service and Leadership

February 2, 2009

Marcie Mangold
Washington Department of Ecology
4601 N. Monroe
Spokane, WA 99205

RE: Priest Rapids Hydroelectric Project No. 2114 Pacific Lamprey Management Plan

Dear Marcie;
Per sections 6.2(6)(b) and 6.2(6)(e) of the 401 Certification for the Priest Rapids Project, the Public Utility District No. 2 of Grant County (Grant PUD) has enclosed a document titled "*Priest Rapids Project Pacific Lamprey Management Plan.*"

In accordance with the 401 Certification, the Pacific Lamprey Management Plan has been reviewed by the Priest Rapids Fish Forum (PRFF) and other interested stakeholders. Grant PUD has reviewed the comments received and incorporated suggested edits into the attached plan. Grant PUD has also included an implementation schedule, comment letters/emails received from agency and tribal representatives, as well as a summary of Grant PUD's responses in the appendices of this plan.

If you have questions and/or comments regarding the Priest Rapids Project Pacific Lamprey Management Plan, please contact me at PO Box 878, Ephrata, WA 98823 or by e-mail at tdresse@gcpud.org.

Respectfully;

Tom Dresser
Manager; Fish, Wildlife, and Water Quality

Cc: Priest Rapids Fish Forum

Enclosures: Priest Rapids Project Pacific Lamprey Management Plan

Priest Rapids Project - FERC P-2114

Pacific Lamprey Management Plan

License Article 401(a)(12)

Public Utility District No.2 of Grant County
P.O. Box 878
Ephrata, WA 98823

January 2009

Executive Summary

Public Utility District No. 2 of Grant County (Grant PUD) owns and operates two hydroelectric dams on the Columbia River; Wanapum and Priest Rapids, known collectively as the Priest Rapids Project (Project), and operated under the terms and conditions of Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. 2114.

Grant PUD operates the Priest Rapids Project through the coordinated operation of the seven-dam system and other Columbia Basin entities with current operational agreements the other mid-Columbia public utility districts (Chelan and Douglas PUDs), with the fishery agencies and other operators to provide protection and enhancement for a range of fisheries within, and downstream of the project. These agreements include the Hanford Reach Fall Chinook Protection Plan, the Hourly Coordination Agreement, and the Priest Rapids Project Salmon and Steelhead Settlement Agreement. The Project is also subject to the provisions of the FERC license and related laws and regulations, as well as to the requirements (incorporated in the new FERC license to operate the Priest Rapids Project) of the 2008 Biological Opinion for the Priest Rapids Project issued by National Marine Fisheries Service (NMFS) for its effects on anadromous salmon, the Clean Water Act Section 401 Water Quality Certification issued by the Washington Department of Ecology (WDOE), and the Biological Opinion for the Priest Rapids Project issued by the United States Fish and Wildlife Service (USFWS) regarding the effects of the Project on bull trout.

A 401 Water Quality Certification was issued by the Washington State Department of Ecology (WDOE) on April 3, 2007, and amended March 6, 2008, for the operation of the Priest Rapids Hydroelectric Project. A new license for the Project was issued by FERC on April 17, 2008 (FERC 2008). Under FERC License Article 401(a)(12) and the 401 Certification (6.2 (5)(b)), Grant PUD is required, in consultation with the Priest Rapids Fish Forum (PRFF), to develop and submit for approval a Pacific Lamprey Management Plan (PLMP) within one year of issuance of the New License. The PLMP will be implemented upon FERC approval.

The goal of the PLMP is to identify ongoing Project-related impacts on Pacific lamprey; implement reasonable and feasible measures to reduce or eliminate such impacts; and implement on-site or off-site measures to address unavoidable impacts in an effort to achieve No Net Impact (NNI) as identified in the 401 Certification. The PLMP is intended to be an adaptive management approach where strategies for meeting the goals and objectives may be adjusted through a collaborative effort with the stakeholders based on new information and ongoing monitoring results. The plan is also intended to be consistent with the other management plans in the mid-Columbia region. The following objectives were established to identify any negative impacts on Pacific lamprey from ongoing Project operations and fishways, and to develop Protection, Mitigation, and Enhancement measures (PMEs) to reduce or eliminate those impacts, in consultation with the PRFF or a designated alternative group of utility, agency and tribal representatives. Objectives to achieve this goal include the following: (1) No Net Impact (NNI). Identify, address, and fully mitigate Project effects to the extent reasonable and feasible, (2) Provide safe, effective, and timely volitional passage (as defined by the PRFF) for adult upstream and downstream migration, (3) Provide safe, effective, and timely volitional passage (as defined by the PRFF) for juvenile downstream migration, and (4) Avoid and mitigate Project impacts on rearing habitat. The following tasks are consistent with achieving the Biological

Objectives and have been incorporated into the PLMP: (1) identify and address Project effects on upstream and downstream passage of adult Pacific lamprey, (2) identify and address Project effects on downstream passage of juvenile Pacific lamprey, (3) identify and address Project effects on the reservoir habitat as used by juvenile Pacific lamprey, and (4) identify and implement measures to mitigate Project effects on Pacific lamprey at the Priest Rapids Project.

The PLMP emphasizes a monitoring program that will necessitate future consultation with the PRFF to evaluate monitoring results and develop recommendations for program direction. Accordingly, the PLMP will be reviewed on a periodic basis by the PRFF to allow for planning and future adjustments over the term of a New License. In addition, the PLMP is intended to be consistent with other Pacific lamprey management plans in the mid-Columbia region.

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1.0 Background

Pacific lamprey are indigenous to many of the tributaries of the Columbia (Jackson et al. 1997a, Jackson et al. 1997b) and the Snake rivers (Close et al. 1995). Wydoski and Whitney (1979) reported that the Pacific lamprey is one of three species of lamprey in the Columbia River Basin where river lamprey (*L. ayresii*) and western brook lamprey (*L. richardsoni*) also exist. Western brook lamprey and river lamprey distributions overlap with the more common Pacific lamprey but populations are concentrated to coastal tributaries and the lower reaches of the Columbia River (Kostow 2002).

The Pacific lamprey is an important fish of cultural, utilitarian, and ecological significance (Close et al. 2002). Close et al (1995) reported that Native American tribes of the Pacific Coast and interior Columbia Basin harvested Pacific lamprey for subsistence, ceremonial, and medicinal purposes. In addition, a commercial fishery for Pacific lamprey also occurred during the 1940s and was used as food for livestock and cultured fish. Pacific lamprey are important ecologically throughout their life terms of nutrient cycling, both as predator and prey. As juveniles, lamprey are filter feeders of detritus and algae, and a food source for fish and birds (Close et al 2002). In the past when they were more numerous, downstream migrants were likely an important food source to fish and birds and provided a buffer effect for juvenile salmon migrants. As adults, lamprey are opportunistic feeders and prey on a variety of fish species, thereby minimizing their impact on any particular one species. Adult Pacific lamprey are also a prey item to marine mammals such as sea lions and likely attract predation away from adult salmon (Close et al. 2002). Pacific lamprey carcasses are a food source to sturgeon, and decomposition provides marine derived nutrients to riverine systems.

Adult lamprey counts have decreased at all Columbia and Snake river dams, with the greatest declines occurring at the upper Columbia River projects. Passage counts of adult and juvenile lamprey at Bonneville, the Dalles, John Day, McNary, Ice Harbor, Rock Island, Rocky Reach, and Wells dams indicate a general decreasing trend; large declines occurred in the late 1960s and early 1970s (Bioanalysts 2000).

The most recent genetic stock information suggests there is uncertainty among different Pacific lamprey stocks regionally. Powell and Faler (2001) determined that Pacific lamprey do not appear to have genetically different stocks, at least between some lower and mid-Columbia basins which is similar to results found by Goodman (2006) that found no evidence of mitochondrial DNA divergence in 81 collections of Pacific lamprey from two of the geographical regions common to the Columbia River and Klamath Mountain Province. Conversely, Lin (2007) found significant differences among collections within those regions. Those results detected significant genetic differences among adult Pacific lamprey returning to streams separated by as little as 87 km (between the Deschutes River and John Day Dam), the geographical scale over which genetically meaningful management units (e.g., stocks, populations, or evolutionarily significant units) occur in this species could not be identified based on their results.

Pacific lamprey do not appear to have in-season homing tendencies (return to a place of initial choice in a migrational period), but will migrate to other locations (Hatch et al. 2001). Distribution is more uncertain in the mid-Columbia area above Priest Rapids Dam, but since 1958 the furthest upstream extent on the Columbia River has been Chief Joseph Dam where

there are no fish passage facilities. BioAnalysts (2000) summarized anecdotal information on the distribution of juvenile lamprey in tributaries of the mid-Columbia, which include the Wenatchee, Entiat, Chelan, and Methow rivers. Recent evidence indicates the presence of lamprey in the Similkameen River, a tributary of the Okanogan River (T. Holder, Washington Department of Fish and Wildlife, pers. comm.) previously thought unused by Pacific lamprey.

Most of the information related to Pacific lamprey in the mid-Columbia area is incidental to research programs focusing on salmon. For example, the U.S. Fish and Wildlife Service (USFWS) in Leavenworth, WA conducted a juvenile trapping operation in the spring of 2002 on the Entiat River, and caught more juvenile lamprey than any other species of fish (USFWS 2002). Over 800 lamprey were captured and consisted of several different age classes. In another juvenile salmon trapping study, Nass et al. (1998) caught four ammocoetes in five nights of trapping on the lower Methow River. Murdoch (Yakima Nation, Leavenworth, WA, pers. comm.) observed an abundance of ammocoetes during a fish salvage operation in a recently dewatered irrigation canal stemming from Dryden Dam on the Wenatchee River. The catch or observed lamprey in these studies was only keyed out to genera, so it is unknown as to what species of lamprey (Pacific, River or Brook lamprey) they were. A survey of 23 sites in the Yakima River basin found only one specimen of river lamprey (Cuffney et al. 1990). Unlike Pacific lamprey, western brook and river lamprey have very short lives as adults making capture and positive identification difficult (Kostow 2002).

Conservation groups filed a lawsuit against the U.S. Fish and Wildlife Service (USFWS) in May 2004 to compel USFWS to act on their January 27, 2003 petition to list four species of lamprey, including Pacific lamprey. On October 1, 2004, the USFWS initiated its 90-day finding process as part of a settlement with the conservation groups. On December 22, 2004, the USFWS announced that a petition to list four species of lamprey did not contain sufficient information to warrant further review at that time.

1.1 General Biology and Ecology

Elongate and snake-like in form, the lamprey is a relatively poor swimmer compared to teleosts in areas of high velocity flow due to its anguilliform swimming motion in contrast to the more efficient subcarangiform motion used by salmonids (Weihs 1982 as cited in Mesa et al. 2001). The lamprey does not have rigid fins, but rather dorsal and ventral fin-folds with minor cartilaginous ray-like supports. In addition, it lacks a swim bladder and must keep swimming (or attach to something), or it will sink.

The lamprey develops morphologically and physiologically in three primary stages: after hatching, it will remain a larvae or ammocoete for five to seven years (10-200 mm), before it enters a transformation to an adult. During transformation, which usually occurs between July and November (Pletcher 1963, Hammond 1979, and Beamish and Northcote 1989 as cited in Close et al. 2002), the shape and angle of the head and mouth changes, and the gut develops to allow consumption of flesh and fluids (Hart 1973).

Lamprey eggs are deposited in a redd and hatch after approximately two to three weeks, depending on the temperature regime (Scott and Crossman 1973). After hatching, larvae drift freely downstream until encountering suitable substrate (silt and sand) and flow conditions (low velocities) for a sedentary lifestyle (Pletcher 1963 as cited in Close et al. 2002). Larvae (also

termed “ammocoetes” or “lamprey that have not yet begun metamorphosis”) burrow into the substrate and reside there, filter feeding detritus and algae for an estimated four to seven years (Pletcher 1963; Kan 1975; Richards 1980 as cited in Close et al. 2002). Beamish and Levings (1991) observed peak downstream movement of ammocoetes during May and June (Table 1) and determined ages to range from two to six years (using statolith analysis, Volk 1986 as cited in Beamish and Levings 1991).

Table 1 Annual Timing of Key Biological Events in the Freshwater Life History of Pacific lamprey

Annual Timing of Key Biological Events in the Freshwater Life History of Pacific Lamprey

Event	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ammocoete downstream migration[1]	Unk											Unk
Young adult downstream migration[1]	Unk											Unk
Metamorphosis / Transition[2]												
Parasitic feeding initiated[2]												
Entry into saltwater[2]												

[1] Beamish and Levings (2001)
[2] Beamish (1980)
Peak period = dark shade

Morphological and physiological transformation, or metamorphosis (e.g., the development of eyes), defines the young adult stage which begins in the latter period of substrate residence. The young adult stage continues during stream residence and into the period of downstream migration. The causal mechanisms which initiate the transformation process trigger emergence from the substrate, and result in migratory behaviors appear to be unknown. Young adult lamprey are also termed macropthalmia once the major morphological changes have occurred, but before parasitic feeding begin (Hardisty and Potter 1971 as cited in Beamish 1980).

During transformation, which occurs between July and November (Table 1; Pletcher 1963 and Hammond 1979, as in Close et al. 2002; Beamish and Northcote 1989), the shape and angle of the head and mouth shifts, and the gut develops to allow consumption of flesh and fluids (Hart 1973). Parasitic feeding can begin before the transformation is complete, but the teeth must be in place, the esophagus open, and the digestive system ready for the novel food types. In addition, the eyes fully develop and physiological changes occur to allow osmoregulation in saline water. The onset of transformation occurs over a relatively large range in lengths. Beamish (1980) observed characteristics associated with metamorphosis in lamprey ranging from 47 mm to 160 mm. As such, there is overlap in the length distribution of larval and young adult lamprey.

Beamish and Levings (1991) determined age distributions for young adults to be four to eight years using statolith analysis (Volk 1986 as cited in Beamish and Levings 1991). Metamorphosing lamprey moved into progressively more rocky and higher flow environments over time (Richards 1980 as cited in Beamish 1980), which may be related to their specific stage of transition. Concurrent downstream migrations of several different lamprey life-stages (including ammocoetes and young adults of many different stages of metamorphosis) has been

observed (Table 1), providing evidence of natural variation in the timing and developmental stage of migrating lamprey (Beamish and Levings 1991).

Juvenile Pacific lamprey have been found to be largely nocturnal, with >90% of their swimming activity restricted to hours of darkness (Moursund et al. 2000). This is consistent with prior reports that outmigrating individuals were more active at night settled onto or into the substrate during the day (Hardisty and Potter 1971 as cited in Moursund et al. 2000; Beamish and Levings 1991). However, strict diel movement patterns appear to be restricted to the upper watershed areas, whereas the migration appears more or less continuous (night and day) in the lower parts of the river (Beamish and Levings 1991).

Lamprey are considered adults once all transformations are complete and parasitic feeding begins; a process that is likely completed in salt water (Richards and Beamish 1981 as cited in Beamish and Levings 1991). In addition, laboratory research by Beamish (1980) surmised that completely transformed lamprey (i.e., adults) must move into a saline environment within a relatively short period of time, or they will die. Specifically young adults completing the transition to adulthood between June and September need to be in salt water by January, or at the very latest, July. Physiological experiments showed that Pacific lamprey in the Fraser River begin entering saltwater in December and continue through June (Beamish 1980; Table 1).

In the mid-Columbia River area, including the Priest Rapids Project, juvenile lamprey are captured during juvenile salmon collection or salvage activities from April through June. At Wanapum and Priest Rapids dams, juvenile lamprey are captured during the fish bypass operation of gatewell dipping (Grant PUD, unpublished data). A portion of the catch is counted and measured for length; and all fish are subsequently released downstream of the Project. In some years, lamprey have been counted, but not identified beyond the genus level of classification (there are three species of *Lampetra* in the Columbia River). In a separate operation, fyke net sampling at Wells Dam caught lamprey during the period March through August, with the highest catches occurring in May and June (BioAnalysts 2000).

As an adult (100-700 mm), the animal is fully developed to handle life in salt water, which ranges from 1.5 to 3.5 yr (Kan 1975 and Beamish 1980 as cited in Close et al. 2002). As a filter feeder in its juvenile stage, and a parasite on other fish in the later adult stage, the lamprey has a disk-like funnel for a mouth. As an adult, it has a series of teeth at the center of the disk it can use to tear the skin of its prey. The mouth disk is also an important tool for the lamprey during migration. Like a suction cup, the lamprey can attach to hard substrates to remain stationary. By swimming in bursts, and subsequently initiating an attachment to rest, the lamprey can achieve upstream movements in flowing waters.

1.2 Adult Migration in Rivers

The upstream migration of adult Pacific lamprey in the Priest Rapids Project area (Rkm 639-730) typically occurs from May through November, with peak migration occurring in August. In the lower Columbia River (Bonneville Dam, Rkm 235), this timing is shifted earlier by approximately one month (Ocker et al. 2001). Similarly, peak migration past dams upstream of Priest Rapids occur two to four weeks later. As expected, numbers of lamprey observed at successive dams decreases as fish enter tributaries, however the inherent inaccuracies of counting lamprey is apparent in some years when numbers seen upstream are actually higher.

Median upstream migration rates have been estimated at 16 Rkm/d and 22 Rkm/d on the Columbia River (Jackson et al. 1997b and Vella et al. 2001, respectively), and 11.0 Rkm/d on the John Day River (Bayer et al. 2001). Likely heading for tributaries of the Columbia, lamprey travel to holding or spawning areas to overwinter. Upstream migration has been documented to stop in mid-September (Beamish 1980 as cited in Close et al. 2002), and resume in mid-March of the following spring if the final spawning destination has not been reached (Bayer et al. 2001). Spawning occurs in the summer (June and July) following the upstream migration year (Beamish 1980 as cited in Close et al. 2002). Lamprey prefer low-gradient reaches, with gravel-pebble-sand substrate for spawning (Mattson 1949 and Kan 1975 as cited in Close 1995), and sand or silt for juvenile rearing (Pletcher 1963 and Richards 1980 as cited in Close et al. 2002). Pacific lamprey die after spawning (Hart 1973).

1.3 Population Status

Pacific lamprey populations of the Columbia River have significantly declined in abundance in recent years as evidenced by counts at dams on the lower Columbia and Snake rivers (Close et al. 1995, Vella et al. 1999, Close et al. 2002). Starke and Dalen (1995) reported that adult lamprey counts at Bonneville Dam that regularly exceeded 100,000 fish in the 1960s were estimated at approximately 22,000 in 1993. Specific reasons for this decline are not fully understood, but have been related to similar factors contributing to the decline of Pacific salmon. Close et al. (1995, 2002) identified several factors that may account for the decline in lamprey counts in the Columbia River basin. This includes reduction in suitable spawning and rearing habitat from flow regulation and channelization, pollution and chemical eradication, reductions of prey in the ocean, and juvenile and adult passage problems at dams. Comparison of counts between dams and between years and is complicated by variable and inconsistent sampling protocols (BioAnalysts 2000), potential over-wintering between dams, changes in personnel, and counting station passage efficiency (the ability of count station equipment to force individuals through a counting area for observation). Annual counts of adult Pacific lamprey passing mainstem dams in the mid-Columbia River and lower Snake River are summarized below in Table 2.

In addition to adult dam counts, the lack of ammocoetes in surveys in the Snake River Basin and limited information of juvenile use in the upper Columbia River tributaries is an indication of the decline of Pacific lamprey populations. A study conducted by Idaho Fish and Game from 2000 – 2006 determined that Pacific lamprey currently occupy only about 25% of their historic distribution in the Snake River Basin (Hyatt et al. 2006).

Table 2 Annual counts of adult Pacific lamprey at lower Snake River and mid-Columbia River dams.

Year	McNary	Priest Rapids	Ice Harbor	Wells	Lower Granite
2000	1,281	1,468	315	NA	28
2001	2,539	1,624	203	261	27
2002	11,282	4,007	1,127	338	128
2003	13,325	4,339	1,702	1,408	282
2004	5,888	2,647	805	291	117
2005	4,158	2,598	461	212	40
2006	2,139	3,273	255	21	35
2007	3,389	3,419	288	32	34
2008*	1,530	5,068	264	7	61

*Adult Pacific lamprey at Lower Snake River and Mid-Columbia River dams up to October 22, 2008

Degraded water quality has been identified as a potential cause of declining lamprey populations (Bioanalysts, 2000). Section 6.1 of the 401 Certification requires Grant PUD to comply with all of WDOE's WQ standards that are codified in WAC 173-201A, which includes prohibiting the discharge of any soild or liquid waste to waters of the state. Section 6.4 includes provisions for monitoring total dissolved gas (TDG) at Grant PUD's fixed-site monitors (in the forebay and tailrace of each dam) on an hourly basis throughout the year. Water temperature will also be monitored at the same fixed-site monitoring locations on the same time-scale as TDG, and Section 6.5 of the 401 provides other water temperature requirements, such as the development of the MASS1 model to simulate possible Project affects on water temperature. Section 6.6 of the 401 Certification provides conditions related to localized Project affects, which requires periodic monitoring of dissolved oxygen and pH for the term of the new license; this will be done at the fixed-site monitors. Details on the requirements, methods, and other information related to monitoring TDG, water temperature, DO, and pH were included in Grant PUD's draft Quality Assurance Project Plan (QAPP), which was sent to the WDOE and PRCC on 12/19/08 (Hendrick 2008) Section 6.6 also provides conditions related monitoring temperature, DO, and pH in shallow water habitats, conducting fish-ladder temperature monitoring studies, monitoring for and preventing the introduction/spread of aquatic invasive species within the Project, and periodically monitoring for toxic constituents within stormwater. Individual QAPPs/study plans for these requirements will be submitted to the PRFF and Ecology for approvals according the schedule provided in those sections. Additionally, Section 6.8 of the 401 Certification provides conditions related to construction activities within the Project, while Section 6.9 contains requirements related to spill prevention and control (e.g. Spill Prevention Control and Counter Measure (SPCC) Plans). Grant PUD believes those measures included in the 401 Certification will be sufficient to protect Pacific lamprey from issues and concerns related to degraded water quality.

1.4 Previous Studies

The study of adult lamprey migration patterns past dams and through reservoirs in the lower Columbia River have provided the first data sets on lamprey passage timing, travel times, and passage success at hydroelectric projects (Vella et al. 2001, Ocker et al. 2001, Moser et al. 2002a, Moser et al. 2002b). While these studies have shown that approximately 90% of the radio-tagged lamprey released migrate upstream and get detected at Bonneville Dam, less than 50% of the lamprey which encounter an entrance actually pass the dam. Passage times (2-4 d)

were considerably longer compared to salmonids (1 d). Detailed examination of detection histories for radio-tagged lamprey has concluded that there are several potential explanations for relatively poor passage success for adult lamprey in fish ladders. In general, these factors are associated with unique physical characteristics of fish ladders and include lack of appropriate attachment sites in high velocity areas, degree of sexual maturity in migrants, water flow velocities over 2 m/s, and fishway channel configuration and structure.

A potential physiological problem facing successful passage of Pacific lamprey at dams may be related to their unique method of movement as it relates to specific areas within fish ladders. Typically, lamprey move through an adult fishway in a repeated series of motions consisting of attaching to the ladder floor with their mouths, surging forward, and re-attaching. Adult lamprey have an estimated critical swimming speed of about 0.86 m/s at 15°C (Mesa et al. 2003) and a burst swimming speed calculated at 2.1 m/s (Bell 1990). Average velocities in the fish ladders at Wanapum and Priest Rapids dams are approximately 0.6 – 1.2 m/s in the fish ladders and 1.8 – 2.4 m/s through the slotted entrance gates. The design of the slotted entrance gates is such that the velocity gradient will be near zero at the bottom, and then maintains the average water velocity extending to the surface of the water column (M. Nichols, Grant PUD Hydro Engineering, pers. comm.). The physiological response of adult Pacific lamprey to exhaustive exercise may be immediate, sometimes severe, but short-lived (Mesa et al. 2003). This may suggest that lamprey have difficulty negotiating fishways with high-current velocities.

2.0 Grant PUD Adult Pacific Lamprey Evaluation

To evaluate the effects of Priest Rapids Project dams on adult Pacific lamprey, Grant PUD completed a two-year study of their upstream migration using radio-telemetry (Nass et al. 2003; Technical Appendix E-4.C).

Pacific lamprey were captured and radio-tagged during the period July 23 through September 8, 2001, and July 23 through September 7, 2002 at Priest Rapids Dam on the mid-Columbia River. A total of 51 and 74 fish were radio-tagged and released in the Priest Rapids Dam area in 2001 and 2002, respectively. A combination of fixed-station monitoring at Priest Rapids and Wanapum dams, remote fixed-stations, and extensive mobile tracking were used to determine migration and passage characteristics. Of the lamprey released in 2001, 18 had detection histories in Priest Rapids fish ladders, and three were observed in Wanapum fishways. A total of eight radio-tagged lamprey passed Priest Rapids Dam, and three passed Wanapum Dam. Of the lamprey released in 2002, 48 had detection histories in Priest Rapids fish ladders, and 27 were observed in Wanapum fishways. A total of 41 radio-tagged lamprey passed Priest Rapids Dam, and 23 passed Wanapum Dam. Overall passage success (proportion of approaches to the fish ladder that exit) was 30% and 70% at Priest Rapids, and 100% and 51% at Wanapum in 2001 and 2002, respectively. While lamprey did not spend a relatively large amount of time in the entrances, there was typically a large proportion of lamprey that never entered the fish ladder. In the fish ladders at Priest Rapids, the visual counting stations and the first orifice walls in the lower fish ladder appeared to be the locations of greatest passage delay. In the fish ladders at Wanapum, locations that appeared to delay passage were less obvious than at Priest Rapids; on the left-bank the visual counting station caused the largest delays, and on the right-bank no area caused substantial delays. Overall median dam passage time (first at entrance to last at exit) was 1.2 d and 1.1 d at Priest Rapids, and 1.1 d and 1.8 d at Wanapum in 2001 and 2002, respectively. The last known locations of 2001 radio-tagged lamprey extended from Coyote Rapids to the

tailrace of Rock Island Dam, and the last known locations of 2002 radio-tagged lamprey, extended from Coyote Rapids to the forebay of Rocky Reach Dam.

Passage success was poor in 2001 with only 15.6% of tagged lamprey passing Priest Rapids Dam and 5.9% passing Wanapum Dam. The researchers believed that tag and handling effects were biasing the results, so smaller tags were used in 2002, and tagging protocol for tag weight in relation to lamprey size were adjusted downward. In 2001, lamprey were surgically implanted with a large (3BM) radio tag if both mid-girth and weight measurements were 11.5 cm and 500.0 g (or greater), respectively. Small nanotags were implanted into lamprey if both mid-girth and weight measurements were 10.5 cm and 450.0 g (or greater) in 2002, respectively. These minimum tagging measurements were similar to those used in a study of Pacific lamprey passage at Bonneville Dam (M. Moser. pers. comm. 2001). Improved passage success was observed in 2002, when 56% of the lamprey released below Priest Rapids Dam passed successfully, and 26% of the 74 tagged lamprey successfully passed Wanapum Dam. Grant PUD believes that this increased passage success was positively correlated with the use of smaller tags in 2002. Passage times ranged from 0.2 to 55 days during the study with median passage times of 1.1 days at Priest Rapids Dam and 1.8 days at Wanapum Dam during 2002 when tagging and handling procedures had been adjusted (Table 3, Nass et al. 2003). This information strongly suggests that any measurement of upstream passage success will be affected to some degree by tagging and handling. This is particularly important as recent agency recommendations have focused on development of upstream passage success criteria. Development of such criteria appears to be premature given that tagging techniques clearly have a direct effect on these measurements.

Table 3 Pacific Lamprey Fishway Passage Comparison (Chelan PUD, 2005). Net Ladder Passage Efficiency (NLPE) is the proportion of fish detected in the tailrace of the dam that exit the upstream fishway, and which adjusts for downstream passage and re-ascent.

Location	Dam Detection	Entered Fishway	Exited Fishway	NLPE
Bonneville Dam	82.4-93.3%	28.6-88.0%	46.1-50.3%	25.7-42.1%
Priest Rapids Dam	96.80%	62.2-80.3%	27.8-85.7%	29.2-62.3%
Wanapum Dam	91.80%	62.2-80.3%	82.10%	48.90%
Rocky Reach Dam	93.60%	94%	55.50%	47%

This adult Pacific lamprey study identified several aspects of fish ladder usage that potentially delay or impede lamprey upstream migration. These locations include:

- The physical attributes and high velocity of fish ladder entrances near surface may exceed lamprey swimming ability;
- Transitional areas such as the attraction channel, collection channel and junction pool may have hydraulic conditions that confuse upstream movement;
- The attraction water supply channel and water supply conduit may cause false attraction where diffusion gratings make up the entire flooring in specific areas of the fish ladders;
- Count stations at Priest Rapids and Wanapum have weirs or board spacing that allow lamprey to pass the count boards or the video count window undetected. This may cause delay and also biases lamprey counts low; and

- High velocities through the fish ladders may delay lamprey migration because these velocities may exceed lamprey swimming ability.

3.0 Evaluation of Project Effects on Juvenile Lamprey for the Priest Rapids Project Area

Lamprey may pass through a hydroelectric structure by several different routes, including the powerhouse (turbines), spillway (bottom or top discharge tainter gates), powerhouse gatewell slots (fish bypass collection area), and adult fishways (and their related water supply systems). Potentially high juvenile lamprey turbine entrainment rates are possible given the tendency of juveniles to swim low in the water column (Long 1968 as cited in Moursund et al. 2000).

The lamprey's ability to survive turbine passage, including response to changes in pressure, turbulent flow, and shear stress are not clearly understood. Another concern is how juvenile lamprey respond to diversion screens which are designed to bypass or divert fish into or toward preferred fish passage routes. For example, investigators reported large numbers of juvenile lamprey impinged between individual bars of fixed bar screens at The Dalles and McNary dams (Hatch and Parker 1998). The effects of blade strike or sub-lethal effects, such as increased vulnerability to predation following turbine passage are not known (Becker et. al. 2003). While screen impingement has shown to be a potential mortality factor at other Projects, it is not a factor at Wanapum and Priest Rapids dams. The approach to downstream passage facilities at Wanapum and Priest Rapids dams has been developed with specific concern for the reduced swimming ability of juvenile lamprey, subyearling Chinook and sockeye. Because of the high rates of impingement and descaling associated with turbine intake screens (Whitman et al. 1990), Grant PUD has emphasized the use of relatively large volumes of water passed through surface spill structures to minimize injury and mortality associated with mechanical bypass systems..

The technology to measure juvenile Pacific lamprey turbine passage does not currently exist; however laboratory assimilation studies were conducted by Moursund et al. (2000) who examined shear stress on lamprey and showed that they did not suffer any ill effects at exposure to the jet velocities that adversely affected salmonids. Neither immediate deaths nor gross injuries were observed. Possible reasons for the hardiness of juvenile lamprey may include their flexibility and the reduced size of vulnerable structures. For example, injuries to salmonids often involved the operculum or jaw; structures absent in lamprey.

Grant PUD has taken an active role in developing downstream passage measures for juvenile salmonids, which could potentially reduce or eliminate impacts to juvenile lamprey. This includes the development of the Wanapum Future Unit Fish Bypass (WFUFB). The WFUFB is located in the Future Unit slot (#11) and has an opening of 18'6" wide and is 68' in depth (at forebay elevation 571.5'). The forebay entrance to the WFUFB is shaped similar to the ogee on the downstream side. Given the tendency for juvenile lamprey to swim low in the water column (Long 1968 as cited in Moursund et al. 2000), it would be expected that the WFUFB would also successfully pass juvenile lamprey. Fyke net capture data from Wells (Douglas PUD) and Rocky Reach (Chelan PUD) further confirm that juvenile lamprey tend to pass via turbines in lower half of the water column (BioAnalysts 2000).

Grant PUD is also in the process of installing the Advanced Hydro Turbine System (AHTS) at Wanapum Dam. The new design incorporates several features to reduce impacts to juvenile salmonids which could reduce impacts to juvenile lamprey, this includes such things as a minimum gate runner at all operating conditions (spiral hub) to reduce gaps, redesign of stay vanes (hydraulically designed), reducing the overhang of the wicket gates, and re-design of the draft tube, which has reduced tailrace egress conditions.

3.1 Effects of Pressure Drop on Juvenile Lamprey

Moursund et al. (2001) subjected lamprey to an abrupt pressure spike (using a hyperbaric chamber) in order to simulate turbine passage. Lamprey were examined for injuries immediately after the trial, and then again after 48 hours. The lamprey showed no immediate or latent injuries. Juvenile lamprey hardiness likely results from their lack of swim bladder, the flexibility associated with an anguilliform body type and cartilaginous skeleton, and the reduced size of vulnerable structures, such as eyes. To further evaluate Pacific lamprey's ability to survive turbine passage, Pacific Northwest National Laboratory (PNNL) scientists conducted laboratory tests designed to measure a juvenile Pacific lamprey's response to the absolute change in pressure or "pressure drop" during passage through a Kaplan turbine simulation.

Tests conducted by PNNL used a hyperbaric chamber to test a single worst-case scenario for lamprey: bottom-acclimated with a surface return. Juvenile lamprey were acclimated to an equivalent pressure of 60 ft. depth for 24 hours prior to passage. The entire pressure sequence lasted about 90 seconds (Becker et. al. 2003). Results from the simulated turbine passage tests showed no immediate external injuries or mortalities for lamprey exposed to rapid changes in pressure, i.e., ~400 kPa to ~5 kPa in 0.1 sec. That juvenile lamprey lack a swim bladder may be one reason for their resistance relative to bluegill sunfish (Becker et. al. 2003).

3.2 Effects of Hydrologic Pressures on Juvenile Lamprey

Tests conducted by PNNL evaluated the physical effects of turbine conditions to lamprey. In 1999, PNNL conducted a shear stress test in which lamprey were exposed to jet flumes at velocities ranging from zero to 60 feet per second. Their findings showed that lamprey were not injured at rates of strain known to injure or kill salmonids (Neitzel et al. 2000). Reasons for the relative toughness of the lamprey may include their flexibility and lack of structures that are vulnerable to shear injury in salmonids, such as a bony skeleton, presence of operculum, and large eyes. Laboratory experiments conducted in 2000 subjected lamprey to abrupt pressure spikes, similar to those occurring during turbine passage, in a hyperbaric chamber. Lamprey exhibited no immediate shear stress or latent injuries (Neitzel et al. 2000). Moursund suggested the differences between the lamprey's response and that of salmonids can be attributed to anatomical differences, especially the lamprey's lack of a swim bladder (Moursund et al. 2003). Studies conducted by PNNL and field observations by the U.S. Army Corps of Engineers show that juvenile lamprey are not likely to be harmed by changes in pressure or shear conditions that occur during turbine passage. These findings suggest that turbine passage may be less harmful than screened bypass systems to juvenile lamprey.

3.3 Assessing the Potential for Impingement on Screen Systems

Swim trials in a laboratory flume showed that Pacific lamprey are fair to weak swimmers, with an average burst speed of 2.3 feet per second. Sustained juvenile lamprey swim speeds averaged

0.75 feet per second over a five-minute interval and 0.5 feet per second over a 15-minute interval (Moursund et al. 2000).

In laboratory conditions at PNNL (2000), lamprey interactions with bar screens using an oval flume fitted with 1/8-inch spaced wedge-wire screen were examined. Lamprey were exposed to the screen at water velocities ranging from 0 to 2 feet per second. Observations were recorded using video cameras and infrared illuminators. At all water velocities greater than zero, the lamprey made contact with the bar screen within one minute of their entry into the water column upstream of the screen. At water velocities up to 1 foot per second, they were able to push off the screen and disperse throughout the test flume. At water velocities greater than 1.5 feet per second, all lamprey made immediate contact with the screen. Seventy percent became impinged within one minute of the exposure. After 12 hours of exposure, 97 percent of the lamprey were impinged on the screen (Moursund et al. 2000).

Physical model data obtained by the U.S. Army Engineer Research and Development Center suggest that the average perpendicular flow velocity at a typical turbine bypass screen is 2.4 feet per second. Field measurements directly on a screen face at John Day support the model data (Weiland and Escher 2001). They also suggest this velocity exceeds the velocities that caused impingement of juvenile lamprey during laboratory tests and was also higher than the average burst speed of the test population. On an extended-length submerged bar screen, local velocities was as high as 10 feet per second and occurred at the upper end of the screen (Weiland and Escher 2001).

3.4 Effects of Vertical or Near-Vertical Bar Screens on Juvenile Lamprey

In 2000, PNNL biologists conducted a series of laboratory studies to evaluate the effects of screen alignment and angles on lamprey impingement. 1999 laboratory flume tests utilized 1/8-inch wedge-wire screen oriented perpendicular to the flow and having vertical bars. Testing in 2000 included having vertical and horizontal bars and screen orientations at 10 degrees from vertical. The angled screen provided upward sweeping velocities that were not present in the previous perpendicular tests. Trials were conducted at velocities from 2 to 5 feet per second. The findings showed lamprey were far more susceptible to become impinged on horizontal bars than on vertical ones. At water velocities of 4 feet per second, 50% of lamprey became impinged on the horizontal bars but none were stuck on the vertical bars. At 5 feet per second, 55% of the lamprey were impinged on the horizontal bars but just 25 became impinged on the vertical bars (Moursund et al. 2002). General findings showed that an increase in either water velocity or the duration of conditions favoring impingement increases the lamprey's chances of permanently becoming stuck on the screens.

Alternative screening material was also tested by PNNL. Previous testing of 1/8-inch square nylon mesh was tested against 2/29-inch bar screen. The narrower spacing was expected to reduce the amount of space for lamprey to work their tails in and become impinged. Testing results showed that while 70% of the juvenile lamprey were permanently impinged on the 1/8-inch bar screen at velocities up to 4 feet per second, none remained stuck on the bars having the smaller 2/29-inch spacing, and just 15% were permanently impinged on the 1/8-inch square mesh (Moursund et al. 2002).

The existing information on the effects of turbine entrainment strongly suggests that downstream mortality for juvenile lamprey passing the Wanapum and Priest Rapids dams may be minimized through efforts to provide surface spill and installation of the advanced turbines. The absence of diversion screen bypass systems further improves the likelihood of high downstream passage survival for juvenile lamprey. Unfortunately, the absence of meaningful numbers of juvenile lamprey and an associated tagging technology make it difficult to quantify these assumptions. The measures below provide the guidelines for use of adaptive management to address these and other key questions.

4.0 Protection, Mitigation, and Enhancement Measures

The goal of the PLMP is to identify ongoing Project-related impacts on Pacific lamprey; implementing reasonable and feasible measures to reduce or eliminate such impacts; and implementing on-site or off-site measures to address unavoidable impacts in an effort to achieve NNI as identified in the 401 Certification.

The PLMP will be based on adaptive management, allowing for the adjustment of goals and objectives through a collaborative process, based on new information and ongoing monitoring results. Adaptive management is defined in Grant PUD's Water Quality 401 Certification (Section (6.2 (2)), which specifies that "the Adaptive Management process has been and will continue to be used for the protection of aquatic species. As outlined in the 401 Certification, adaptive management for Covered Species is provided through the Priest Rapids Project Salmon and Steelhead Agreement process". For non-Covered Species, the adaptive management process was used in the development of the outlined fish management plans, included in Appendix C of the 401 Certification. Under both processes, for each aquatic species, hypotheses were developed regarding Project effects and potential remedial measures. Based on these hypotheses, objectives were developed. Implementation measures were developed, with a schedule. Plans, developed under the Salmon and Steelhead Settlement Agreement and the 401 Certification, will include detailed monitoring and evaluation procedures to determine attainment of Biological Objectives. The results of the evaluations will be reviewed by fish management agencies, tribes, and Ecology, and used to determine attainment of the Biological Objectives. Further measures may be required, as described in 401 Certification Section 6.2 5(c)-(h).

The PLMP emphasizes a monitoring program that will necessitate future consultation with the PRFF to evaluate monitoring results and develop recommendations for program direction. Accordingly, the PLMP will be reviewed on a periodic basis by the PRFF to allow for planning and future adjustments over the term of the license. In addition, the PLMP is intended to be consistent with other Pacific lamprey management plans in the mid-Columbia region. Objectives of the PLMP include:

Task 1: To achieve No Net Impact (NNI). Identify, address, and fully mitigate Project effects to the extent reasonable and feasible;

Task 2: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for adult upstream and downstream migration;

Task 3: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for juvenile downstream migration;

Task 4: Avoid and mitigate Project impacts on rearing habitat.

The information in this section outlines the proposed PMEs for Pacific lamprey through the term of the license. The PMEs contained in this management plan will: 1) protect, mitigate, and enhance lamprey resources for the term of the New License; 2) ensure that the ongoing operation of the Project will not adversely impact lamprey; 3) minimize the effect of any incidental injury or mortality to lamprey that may occur as a result of Project operation or Project effects to lamprey habitat; and 4) ensure adequate monitoring and reporting of results. An implementation schedule summarizing the Biological Objectives and Protection, Mitigation, and Enhancement measures in this Plan is included as Appendix A of this document.

4.1 Objective 1: No Net Impact (NNI). Identify, address, and fully mitigate Project effects to the extent reasonable and feasible.

By March 31 following issuance of the New License, and each year thereafter for the term of the New License, Grant PUD will provide an annual report summarizing activities undertaken to identify and address impacts of the Priest Rapids Project on Pacific lamprey, including results of those activities to achieve NNI. This report shall include a compilation of information on other Pacific lamprey passage and survival investigations and measures being undertaken in the Columbia River Basin in order to determine if adult and juvenile measures being investigated and/or implemented at the Priest Rapids Project are: (i) consistent with similar measures taken at other projects; (ii) appropriate to implement at the Priest Rapids Project; and (iii) cost effective to implement at the Priest Rapids Project.

The 2001 and 2002 radio telemetry study identified areas in the fishways that may have an effect on Pacific lamprey upstream passage (Section 2.0 of this document). As part of this PLMP, Grant PUD will undertake the following measures to evaluate proposed fishway modifications, identify further passage impediments, and determine whether modifications used to facilitate Pacific lamprey passage at other hydroelectric dams in the Columbia River basin may be applicable to Priest Rapids and Wanapum dams. In addition to the updated literature review described in section 4.1, Grant PUD may conduct further Pacific lamprey studies to gather additional information before implementing fishway modifications recommended by the PRFF.

Under this objective, Grant PUD will evaluate any reasonable and feasible improvements to the upstream fishways at Priest Rapids and Wanapum dams which are identified through passage evaluations throughout the Columbia Basin. Since the proposed long-term monitoring will be repeated every 10 years of the term of the License, opportunities for future modifications exist if study results suggest they are reasonable and feasible.

4.2 Objective 2: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for adult upstream and downstream migration

4.2.1 Maintain Adult Fishways

Grant PUD will continue to maintain adult fishways to support adult Pacific lamprey passage. Improvements to “maintain” adult lamprey passage are identified in the sections below. These fishways shall be maintained in a manner not inconsistent with anadromous fish passage criteria

described in the annual Fishway Operations Plan and those criteria specified in the Anadromous Salmonid Passage Facility Guidelines and Criteria Plan (NMFS) including future updates.

4.2.2 Develop Adult Pacific Lamprey Passage Criteria

Grant PUD will develop adult lamprey passage criteria that are not inconsistent with the anadromous fish passage criteria. Criteria will be developed by the PRFF which will consider success achieved at other Columbia River Basin projects and will take into consideration Priest Rapids Project-specific conditions.

4.2.3 Adult Fish Count Systems

Grant PUD will continue to operate and maintain fish count systems at the Priest Rapids Project to include counting adult Pacific lamprey (not inconsistent with methodologies used to enumerate salmonids and other fishes) migrating through the right and left bank fishways at both Priest Rapids and Wanapum dams. These count systems shall be upgraded as fish count systems technology becomes available, and is reasonable and feasible to implement at the Project.

Video counting of adult Pacific lamprey (24 hours/day; 7 days a week; April 15 thru November 15 of each year) shall remain operational at both dams and reports are to be posted on Grant PUD's website at http://www.gcpud.org/resources/resFish/fishCounts.htm and made available for inclusion in regional databases. To the extent feasible, accurate and reliable counting of adult Pacific lamprey will be provided for in-season and real-time run assessment information for regional fisheries managers within one year of issuance of the License.

4.2.4 Comprehensive Passage Evaluation

Within one year of issuance of the license, Grant PUD will develop, in consultation with the PRFF, and implement a comprehensive evaluation of adult lamprey passage of the Priest Rapids Project. A comprehensive evaluation shall ensure that any gaps in knowledge regarding Project effects on adult lamprey passage, not captured in adult lamprey passage evaluation completed by Grant PUD as part of its FLA proposal, shall be evaluated. Development of the adult lamprey passage evaluation shall include but not be limited to an inspection of the Project passage facilities by PRFF members. Within four years of license issuance Grant PUD should have a determination as to whether the FLA-proposed modifications significantly improve adult passage. If not, then Grant PUD shall develop and implement additional measures in consultation with the PRFF.

4.2.5 Junction Pool and Diffusion Grating Improvements

Within two years of issuance of a license and after consultation with PRFF, Grant PUD will implement improvements to the junction pool and the diffusion gratings as identified in the FLA for Priest Rapids Dam. Specifically, this includes modification to a total of 68 diffusion chambers on both the right and left-bank Priest Rapids fishways to improve adult lamprey passage. This will entail bolting aluminum plating to the support angle or the diffusion grating. The plating consists of ¼ x 16-inch aluminum sheets and should be installed on all diffusion grating where the grating extends to the ladder wall. This will provide a 16-inch wide, flat surface adjacent to the walls for lamprey to use as a travel corridor or to facilitate resting in areas of the fishway where diffusion grates make up the flooring.

4.2.6 Adult Telemetry Evaluation

Within one year of completion of fishway modifications at Priest Rapids Dam (diffusion gratings and junction pool, if implemented) Grant PUD will implement a telemetry evaluation, such as through the use of radio telemetry (or other appropriate technologies) to evaluate the effectiveness of fishway modifications for lamprey.

4.2.7 Evaluation of Modifications to all Fishways

Within seven years of issuance of a license, Grant PUD will evaluate those modifications identified for the adult fishways Project-wide to improve lamprey passage as identified per the FLA or as amended by the PRFF.

Biological objectives for supporting designated uses for Pacific lamprey are shown in Table 5. Measures outlined in Table 3 include the development of criteria for adult Pacific lamprey passage success. For example, the results of baseline telemetry studies could serve as a building block for evaluating the effectiveness of future reasonable and feasible modifications. Data resulting from such studies could be considered by the PRFF in determining the success or failure of such modifications.

4.2.8 Evaluation and Efficacy of Reducing Fishway Flows at Night

Following implementation of identified fishway modifications, Project-wide, and all evaluation of these fishway improvements, Grant PUD will begin investigation of the efficacy and advisability of reducing fishway flows at night during peak lamprey migration periods in an attempt to improve adult lamprey passage efficiency and reduce passage times. Priest Rapids and Wanapum dams maintain minimum flow criteria of 2 ft/s in the fish ladders and 6 ft/s for entrance attraction water. Average swimming speed for adult lamprey is 2.8 ft/s. Migration by lamprey has been reported to be almost exclusively at night, with greatest upstream movement occurring between 2200 and 0300 hours (Kelso and Gardner 2000).

The fishway entrance weirs at Priest Rapids and Wanapum dams differ significantly from those at other projects. By design, the entrance weirs resemble that of a slotted hourglass, which reduces surface turbulence and noise generation while maintaining high, near-surface velocities. The sub-surface design extends deeper into the water column compared to those used at other projects. Depth and design of the weirs allows lamprey to enter the fishway near the bottom, where water velocities are minimal comparatively, to surface flows; therefore, energy expended in maneuvering around corners associated with the entrance weir is expected to be substantially less than other designs.

4.2.9 Conduct 10-year Monitoring and Evaluation Studies

Following attainment of the Pacific Lamprey Biological Objectives, every 10th year during the term of the license, or as recommended by the PRFF, Grant PUD will conduct a monitoring and evaluation study of adult Pacific lamprey passage at the Project consistent with monitoring and evaluation required under Section 5(f) under Certification Conditions, using radio telemetry (or other appropriate technologies). However, if Ecology concludes following issuance of the Year Ten status report that a Pacific Lamprey Biological Objective has not been met (Section 5.3 [5.e] under Certification Conditions), Grant PUD shall continue to implement the Adaptive Management process as described in Section 5.3 (2) under Certification Conditions.

4.2.10 Regional Studies

Grant PUD will continue to participate and cooperate in regional studies, forums, and measures with other entities performing those activities when useful information may be obtained about Project impacts. Examples of participation and cooperation may include such things as the monitoring and reporting of information related to the movement of tagged lamprey (tagged under other evaluations) through Project facilities and the project area and providing access to the adult fishways or other project facilities (e.g. adult salmonid off-ladder fish trap) for collection of lamprey for regional research purposes at Priest Rapids and Wanapum dams and within the Project area.

Grant PUD will continue participation in the Columbia River Basin Lamprey Technical Workgroup. This regional technical working group was developed through the Columbia Basin Fish and Wildlife Authority (CBFWA) to identity critical uncertainties of lamprey research throughout the Columbia Basin. Grant PUD will use this forum to review and discuss the effectiveness of upstream lamprey passage measures implemented at other hydroelectric projects in the Columbia River Basin and evaluate whether these measures would be reasonable and feasible to implement at Priest Rapids and Wanapum dams.

Grant PUD shall continue to operate and maintain the adult PIT-tag detection system at the Priest Rapids Dam fishways. Regional co-managers may be able to use PIT-tag detection capability at Priest Rapids Dam in the future for region-wide monitoring and assessment of adult Pacific lamprey returns and migration timing.

Table 4 Summary of Implementation Schedule for Objectives 4.2.1 – 4.2.10 for Pacific Lamprey – Priest Rapids Project

Plan Objective	Description	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2018
4.1	Submit PLMP to FERC	x							
4.2.1	Maintain Adult Fishways	x	x	x	x	x	x	x	
4.2.2	Develop Adult Passage Criteria								
4.2.3	Adult Fish Count Systems	x	x	x	x	x	x	x	
4.2.4	Comprehensive Passage Evaluation		x	TBD	TBD				
4.2.5	Diffusion Plating Installation		x						
4.2.6	Adult Telemetry Evaluation			x					
4.2.7	Evaluate Modifications to Fishways							x	
4.2.8	Efficacy of Reduction of Fishway Flows			TBD				TBD	
4.2.9	Conduct 10-year M&E Studies								x
4.2.10	Participation in Regional Studies	x	x	x	x	x	x	x	x

Table 5 Biological objectives for supporting designated uses for Pacific lamprey at the Priest Rapids Project

Biological objectives for supporting designated uses for Pacific lamprey at the Priest Rapids Project

Designated Use	Biological Objectives	Evaluation Timeframe	Actions if Objective Achieved	Alternative Management Actions	Plan Action
Overall Combined Goal	(NNI) Identify,address, and mitigate Project effects to the extent reasonable & feasible	TBD by PRFF	Continuous reassessment every 10 years	Develop and implement a plan in consulation with the PRFF to address identified problems	Section 4
Adult Upstream Migration	Provide safe, effective and volitional passage at the Priest Rapids Project-	By year 7	Continuous reassessment every 10 years	Develop and implement a plan in consulation with the PRFF to address identified problems	Sections 4.2.1 - 4.2.10
Juvenile Downstream Migration	Provide safe, effective and volitional passage at the Priest Rapids Project-	TBD by PRFF By year 10	TBD - Consult w/PRFF	Develop and implement a plan in consulation with the PRFF to address identified problems	Sections 4.3.1 - 4.3.3
Rearing	Avoid and Minimize Project Impacts on rearing	By year 10	TBD - Consult w/PRFF	Develop and implement a plan in consulation with the PRFF to address identified problems	Sections 4.4.1

Table 6 Summary Criteria of Achievement of Objectives for Pacific Lamprey – Priest Rapids Project

Designated Use	Objective	Measured Parameter	Evaluation Timeframe	Actions if Objective Achieved	Actions if Objectives Not Achieved	Plan Action
Adult Lamprey	Assess adult upstream passage	Operate and Maintain the Video Fish Count System at the Priest Rapids Project Fishways	Annual	Maintain Action. No additional action needed	Investigate and develop a Video Fish Count System at Priest Rapids Project Fishways, which is consistent with methodologies used to enumerate salmonids and other fishes.	Section 4.2.3
Adult Lamprey	Assess adult upstream passage	Operate and maintain the adult PIT-tag Detection System at the Priest Rapids fishways	Annual	Maintain Action. No additional action needed	Investigate and develop a PIT-tag detection system at Priest Rapids Dam, which is consistent with methodologies used to enumerate salmonids and other fishes.	Section 4.2.10
Adult Lamprey	Assess adult upstream passage	Diffusion Chamber Modifications - Conduct radio-telemetry monitioring evaluation	One year after fishway modification	Maintain Action. No additional action needed	Evaluate radio-telemetry information to determine additional passage impediments. Review information collected at other Hydro-facilities	Section 4.2.5; 4.2.6
Adult Lamprey	Assess adult upstream passage	Fishway Flow Modifications - Conduct radio-telemetry monitioring evaluation	Year two after Diffusion Modifications, if unseccessful	Maintain Action. No additional action needed	Evaluate radio-telemetry information to determine additional passage impediments. Review information Hydro-facilities	Section 4.2.7
Adult Lamprey	Assess adult upstream passage	Conduct radio-telemetry evaluations	10 year intervals	Maintain Action. No additional action needed	Develop and implement a collaborative plan to address identified problem(s)	Section 4.2.9
Juvenile Lamprey	Assess juvenile reservoir rearing habitat; overall Project impact	Determine reservoir juvenile presence/absence and relative abundance	Within 10 years of New License	Maintain Action. No additional action needed	Develop and implement a collaborative plan to address identified problem(s)	Section 4.4.1

4.3 Objective 3: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for juvenile downstream migration.

4.3.1 Identification and Mitigation of Project effects on Juvenile Pacific Lamprey

In a timely manner, but no later than 10 years following license issuance, identify and mitigate Project effects on juvenile Pacific lamprey with the intention of meeting juvenile lamprey passage criteria referred to in 4.3.2 below. Grant PUD is developing downstream passage measures for juvenile salmonids, which may also reduce or eliminate impacts to juvenile lamprey. This includes the Wanapum Future Unit Fish Bypass (WFUFB), which not only capitalizes on the behavioral responses of smolts related to hydraulic conditions in the Wanapum forebay, where the bulk surface flow is directed to the right side of the powerhouse, it also extends to a depth of 68 feet. Given the tendency for juvenile lamprey to swim low in the water column (Long 1968 as cited in Moursund et al. 2000), it is anticipated that the WFUFB will successfully pass juvenile lamprey. Fyke net capture data from Wells (Douglas PUD) and Rocky Reach (Chelan PUD) dams confirm that juvenile lamprey tend to pass via turbines in lower half of the water column (BioAnalysts 2000).

4.3.2 Develop Juvenile Passage Criteria

When the technology exists, Grant PUD will evaluate bypass, turbine, and spillway survival, and utilize this information to develop juvenile lamprey passage criteria. Criteria will include consideration of; 1) success achieved at other Columbia River Basin projects and, 2) Project-specific conditions. Grant PUD has avoided the use of turbine intake or deflector screens, which has shown to be a potential mortality factor for juvenile lamprey at Projects in the Columbia River basin. The turbine intakes at both Wanapum and Priest Rapids dams are not equipped with barrier or diversion type screens of any kind so harm to juvenile lamprey would be negligible. Specific activities associated with this objective include operation of the WFUFB, Priest Rapids Future Unit Bypass (in development), and Wanapum Advanced Turbines in accordance with the criteria for the Biological Opinion for the Priest Rapids Project and Priest Rapids Salmon and Steelhead Anadromous Settlement Agreement, as approved and/or amended by NMFS or Federal Energy Regulatory Commission.

4.3.3 Regional Studies

Grant PUD will participate in regional studies and cooperate with other entities performing those studies when useful information may be obtained about Project impacts to lamprey. For instance, when fish tagged under another study or studies enter the Project boundary, Grant PUD will participate in the study by monitoring and reporting on movement of tagged individuals within and through the Project area.

4.4 Objective 4: Avoid and mitigate Project impacts on rearing habitat.

4.4.1 Juvenile Lamprey Presence/Absence, Habitat Use, and Relative Abundance in the Project Area

In a timely manner, but no later than 10 years following license issuance, Grant PUD will determine juvenile Pacific lamprey presence/absence, habitat use, and relative abundance within the Priest Rapids Project. As part of this measure, Grant PUD shall use existing aerial photographs, bathymetry, shoreline slope, velocity, and substrate characteristics to segregate habitat types into those areas with high, medium, and low potential for use by juvenile lamprey, and assess presence/absence in areas that may be affected by Project operations using electroshocking sampling (if permitted). If electroshocking is not permitted, alternative measures will be evaluated (Moser and Close, 2003a, 2003b).

If significant ongoing Project effects are identified through the investigations described in this section, Grant PUD shall, in consultation with the PRFF, develop a plan and implement reasonable and feasible measures to address such effects.

5.0 Consultation

On June 23, 2008, Grant PUD submitted a draft Pacific Lamprey Management Plan (PLMP) to the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, Wanapum, Yakama Nation, Colville Confederated Tribe, Confederated Tribes of Umatilla, Bureau of Indian Affairs, and Washington Department of Ecology for 60-day comment/review. The PLMP was also sent to a representative of the Columbia River Inter-Tribal Fisheries Commission (CRITFC) on July 23, 2008 and re-sent to on August 6, 2008. To give the parties more time to review, Grant PUD extended the comment period to September 18, 2008. Following the September 18, 2008 comment deadline, CRITFC submitted additional comments on January 5, 2009 which were subsequently discussed and addressed by members of the PRFF on that date.

A total of seven comment letters and/or emails were received (Appendix B). Comments were received from the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Bureau of Indian Affairs, Yakama Nation, Columbia River Inter-Tribal Fish Commission, and the Wanapum. A summary of Grant PUD's responses are included in Appendix C.

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Appendix A
Implementation Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Proposed Pacific Lamprey Management Plan Schedule***	**10698 days**	**3/31/08**	**3/31/49**	
2	Priest Rapids Project License Issued	0 days	4/17/08	4/17/08	
3	**License Compliance**	**342 days**	**4/17/08**	**8/9/09**	
4	Develop Draft Pacific Lamprey Management Plan for PRFF	67 edays	4/17/08	6/23/08	
5	PRFF Comment Period on Draft Pacific Lamprey Management Plan	60 edays	6/23/08	8/22/08	4
6	Submit draft Pacific Lamprey Plan to WDOE	0 ewks	11/12/08	11/12/08	5
7	WDOE review of draft Lamprey Management Plan	60 edays	11/12/08	1/11/09	6
8	Finalize Pacific Lamprey Management Plan	4 emons	1/11/09	5/11/09	7
9	Submit final Lamprey Management Plan to FERC	0 days	5/11/09	5/11/09	8
10	FERC review (this time-frame is an estimation only)	90 edays	5/11/09	8/9/09	9
11	FERC determination on Final Lamprey Management Plan	0 days	8/9/09	8/9/09	10
12	**Implement Pacific Lamprey Management Plan**	**10698 days**	**3/31/08**	**3/31/49**	
13	**Adult upstream and downstream passage**	**5364 days**	**4/17/08**	**11/8/28**	
14	Develop, in consultation with PRFF, and implement evaluation of lamprey passage through PRP	365 edays	4/17/08	4/17/09	2
15	Determine whether FLA-proposed modifications significantly improve lamprey passage	48.7 emons	4/17/08	4/17/12	2
16	Maintain adult fishways to support lamprey passage	120 emons	4/17/08	2/24/18	2
17	Develop adult lamprey passage criteria consistent with anadromous fish passage criteria	120 emons	4/17/08	2/24/18	2
18	Continue operation and maintenance of fish count systems to include adult lamprey	120 emons	4/17/08	2/24/18	2
19	PRFF tour of fish facilities	0 days	11/17/08	11/17/08	2
20	Implement improvements to junction pool and diffusion gratings (during 2009-2010 winter fish ladder outage)	3 emons	11/15/09	2/13/10	2,11
21	**Evaluate effectiveness of fishway modifications on Pacific Lamprey (telemetry)**	**1435 days**	**8/9/09**	**2/9/15**	
22	Conduct telemetry evaluation	6 emons	8/1/11	1/28/12	20
23	Implement all modifications identified for the adult fishways Project-wide to improve lamprey passage	67 emons	8/9/09	2/9/15	11
24	Investigate efficacy and advisability of reducing fishway flows at night during peak lamprey migration to improve passage efficiency and times	120 emons	2/9/15	12/18/24	23
25	Conduct M&E study of adult lamprey passage using radio telemetry	1 emon	8/15/18	9/14/18	
26	Yr 10 status report (determine whether Biological Objectives have been met)	0 emons	12/31/18	12/31/18	25
27	If Biological Objectives have not been met under 401 Cert conditions, continue to implement Adaptive Management process	120 emons	12/31/18	11/8/28	26
28	Participation in regional Pacific lamprey studies	120 emons	4/17/08	2/24/18	2
29	**Juvenile downstream passage and reservoir rearing**	**2572 days**	**4/17/08**	**2/24/18**	
30	**Identify and mitigate Project effects on juvenile lamprey with intention of meeting juvenile criteria (w/in 10 yrs of license issuance)**	**2572 days**	**4/17/08**	**2/24/18**	
31	Determine juvenile lamprey presence/absence, habitat use, and relative abundance in PRP	120 emons	4/17/08	2/24/18	2
32	Develop juvenile passage criteria	120 emons	4/17/08	2/24/18	2
33	Participate in regional studies relative to juvenile passage	120 emons	4/17/08	2/24/18	2
34	**Pacific Lamprey Management Activities Annual Report**	**10698 days**	**3/31/08**	**3/31/49**	
77					
78					
79	*This proposed schedule is only an estimation of approximate time-lines and is subject to FERC approval of the Pacific Lamprey				
80	Management Plan, jurisdictional conflicts, agency schedules, and regulatory permit approval processing				

Appendix B
Comment Letters and E-Mails Received

CRITFC Comments on November 12, 2008 Grant PUD Pacific Lamprey Plan

Executive Summary-

The overall combined goal of the plan as stated in the 401 Cert is to achieve No Net Impact (NNI). "Identify, address and fully mitigate Project effects to the extent reasonable and feasible". This needs to be clarified in the ES.

The tasks 1-4 in the 401 cert are important and should be listed in the ES.

There is no mention or addressing of water quality issues and their potential effect on lamprey in the project area in the plan. These include temperature, DO and toxics that might be released from the projects. The plan needs to have a section that addresses these issues- these are important for the 401 cert.

Page 1.0 Background

Para 3 The greatest lamprey decline has occurred at the upper Columbia Projects, not above the SR dams. The existing statement needs to be corrected.

Para 5 Lamprey "migrate" to many locations. Available information indicates that there is not a stock specific lamprey population structure, so the concept of lamprey "straying" from natal areas is speculative.

Page 2

Para 4 Other than in specific, local high velocity areas such as fishway entrances, Lamprey are good swimmers. Telemetry studies show that they can migrate 10-15 Km or more in a single day. The existing statement should be modified.

Page 5

1.3 The lack of ammocetes in surveys in the Snake Basin and upper Columbia area is also a clear indication of decline of lamprey populations, besides adult dam counts.

Page 7

Para 2 While tagging and handling may have some impact on migration from release to detection at the first dam, the low numbers of adults entering the PR fishway indicate that there are likely structural passage issues at PR. Moser et al. (2002) cited that 88-90% of lamprey, trapped, radio tagged (some with large tags and some with smaller tags) and released below Bonneville dam were detected at the dam fishway and the relatively fast median travel times for these fish indicated little to no handling effects. This is by far a much higher fidelity rate that that for lamprey back to Priest Rapids.

Page 9 Para 2

There have never been direct and indirect mortality studies conducted for juvenile lamprey passing through turbines so it cannot be stated that passage through turbines does not cause mortality.

Page 11 Para 1

The goal of the PLMP is NNI.

Pages 12-15 These are tasks, not objectives per the 401 cert.

Pages 14-15 Not clear whether the entrance velocity of 6 fps will be maintained at night or reduced for lamprey passage to meet the 2.8 fps range.

Page 15

4.2.10 Regional studies. Should include adult lamprey supplementation of upstream areas as a regional study use. Criteria for the best extant adult passage at CR mainstem dams (about 80%) should be the initial target and should be stated in the plan.

Grant should establish half duplex PIT-detection capability at Wanapum as well as Priest Rapids to gain information about passage times and success of lamprey tagged for regional studies as well as project specific studies.

Page 19 Para 1

It is not know how the future bypass system will work for lamprey so it should be stated that we hope it works but it might not and some other passage alternative may be necessary.

Para 2. Until juvenile passage studies have been conducted through project downstream passage routes criteria will not be able to be established. This should be stated in the plan.

4.3.3 Plan should also include Grant's participation and regional collaboration for development of juvenile tagging technologies necessary to determine project impacts on juvenile lamprey.

There should be a table of biological objectives, actions, schedules and benefits provided for juvenile lamprey as well as adults in the plan (see Table 3 in CRITFC Sept 17, 2008 comments).

WANAPUM

01 October 2008

Public Utility District NO. 2 of Grant County
Attn: Tom Dresser, FWWQ Manager
P.O. Box 878
Ephrata, WA 98823

SUBJECT: Pacific Lamprey Management Plan

Dear Mr. Dresser,

The Wanapum appreciate the opportunity to comment on the Pacific Lamprey Management Plan and have the following comments. Pacific Lamprey is an important cultural resource to the Wanapum. Traditionally, past and presently, Wanapum gathered Pacific Lamprey in the Priest Rapids Project area and the Columbia Basin. More recently, Wanapum gathered Pacific Lamprey at the Priest Rapids Dam left and right bank fish ladder. The Wanapum are concerned with the current state of the Pacific Lamprey populations rapid decline. The Wanapum are interested and will actively participate in regional recovery efforts of Pacific Lamprey including Priest Rapids Project efforts. Wanapum are interested in a risk assessment performed on Wanapum consumption of Pacific Lamprey that nest and incubate in the Priest Rapids Project area and areas of lamprey enhancement through regional efforts. Wanapum concerns stem from Pacific Lamprey nesting and incubating in the PRP area and proposed recovery efforts that are exposed to a higher concentration of sediment pollution and contamination. There are various factors that would contribute to more sediment pollution and contamination on Pacific Lamprey in the area compared to other areas along the Columbia River, including agricultural run-off and Hanford Reach seepage and run-off. Wanapum wish to actively participate in any future measures, studies, investigations and discussions made in an effort to address the proper course for Pacific Lamprey restoration that moves towards establishing a healthy stock capable to support traditional Wanapum gathering. We look forward to working with you on those efforts.

Thank you for the opportunity to comment on the draft management plan for Pacific Lamprey. If you would like to discuss our comments, please contact me at (509) 754-5088 ext. 3113.

Sincerely,

Rex Buck Jr.
Wanapum Leader

Steve,
While I share some of your views below, we would implement the diffusion plating, reduce nighttime flows, and anything else that seems prudent (based on the existing information that was collected during our initial studies).....and then use the telemetry study to document the success of the improvements (hopefully it works out that way). I made a few tweaks to the plan based on Bob Rose's, Bob Heinith's, and your comments which you will see at the next PRFF meeting; however, the document was drafted specifically how the 401 reads and what it requires. Outside the scope of the 401, we will have to rely on "Adaptive Management" and new technology to address or measure other effect related to the Project.....and, on top of that, you are correct, we will be reviewing literature and crunching numbers, if our telemetry study identifies other measures/effects on lamprey.

I think it would be helpful to discuss. Will try and give you a buzz this afternoon if possible.

Thanks, Mike

>>> <Stephen_Lewis@fws.gov> 9/17/2008 5:05 PM >>>

Hi Mike-

Thanks for allowing us to provide comments on this plan. After further digestion of this plan, I have additional comments related to this plan. My specific concerns are related to adult lamprey passage at the two projects. I'm thinking that Grant PUD already has a good chunk of telemetry data available at their disposal and this data points to specific corrective measures. On a similar note, we all know that there are commonalities associated with improving adult lamprey passage at various hydroelectric projects. Why not simply implement the measures within the first 2-3 years of the new license versus conducting additional studies that will cost additional money to Grant PUD?? Plating at Priest Rapids and rounded corners/reduction in fishway flows at Wanapum?? I think the current language unfortunately gets us into an endless cycle of conducting literature reviews and examining data?? I don't think this approach is captured in the current version of the plan. Please digest this concept and let's talk when you get chance.

S-

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Hi Tom-

Per Public Utility District No. 2 of Grant County's (Grant PUD) request, below are the U.S. Fish and Wildlife Service's (Service) comments on the Bull Trout Monitoring and Evaluation Plan, Pacific Lamprey Management Plan, and the White Sturgeon Management Plan to be filed with the Federal Energy Regulatory Commission. We reserve the right to provide further comments on these plans during subsequent discussions between the Service and Grant PUD. We request that all the following comments below be incorporated in the formulation of the final drafts of these respective plans:

BULL TROUT MONITORING AND EVALUATION PLAN:

The Service has recently finished its five year status review of bull trout. We suggest that Grant PUD include a discussion of this recently-completed process within section 2.0 Bull Trout Listing, Critical Habitat, and Recovery Planning (pages 1-2);

Section 4.1 Movement and Migration Patterns in the Vicinity of the Priest Rapids Project (pages 4-6) discusses a radio-tagged bull trout that was detected at Wanapum and Priest Rapids dams. Grant PUD states in the plan: "This fish was presumed to be a mortality based on review of telemetry data (Bryan Nass, LGL Limited, personal communication." Whereas, BioAnalysts, Inc.'s 2004 report summarizing bull trout movements in the Columbia River indicates that this same fish was not a mortality. Clarification on this point would be useful.

Section 4.1.1 Assessment of Project Effects on Movement of Bull Trout in the Vicinity of the Priest Rapids Project (page 6) states: "Passage routes at mid-Columbia dams provide bull trout unlimited access to all areas of the mainstem Columbia River and tributaries. While this statement is mostly factual, there are seasonal timeframes (i.e., winter maintenance periods) in which the mid-Columbia hydroelectric projects do not provide unlimited access through all existing upstream fishways. Adding the phrase "with the exception of winter maintenance periods" to the end of the aforementioned sentence would provide further clarity.

Section 4.1.1 Assessment of Project Effects on Movement of Bull Trout in the Vicinity of the Priest Rapids Project (page 6) does not reflect all years of bull trout use at the Project's fish passage facilities. For example, four adult bull trout passed upstream through the Project's Priest Rapids Dam during 2008. Providing all fish passage data through 2008 would provide further clarity.

Grant PUD states in Strategy 1-2 (page 15) that it will continue the counting and reporting of all bull trout life stages moving past Wanapum and Priest Rapids dams between April 15 and November 15 of each year, for an experimental period of five years. The Service suggests adding the following language to account for years beyond year five of this counting and reporting process: "The Service, in coordination with the Priest Rapids Fish Forum, will discuss whether or not to continue the counting and reporting of all life stages moving past Wanapum and Priest Rapids dams beyond year five for the duration of the new license." We also suggest inserting this language into Strategy 2-1 located in section 6.2.1 Strategies for Objective 2 (page 15).

Strategy 2-2 describes an eventual process in which Grant PUD would assess passage and survival of bull trout at Wanapum and Priest Rapids dams. We suggest adding the following language at the end of strategy 2-2 to capitalize on the use of other bull trout in the Columbia River that have been tagged through other similar studies: "Grant PUD will coordinate these assessments with the Service and other mid-Columbia public utility district's."

Strategy 2-7 (page 16) states: "Grant PUD, in coordination with the USFWS, will report incidental take as precisely as possible through the use of empirically collected data including PIT-tagging, radiotelemetry,

or other appropriate technology." The Service would like to remind Grant PUD that incidental take needs to be reported on an annual basis. We would also like to discuss other methods in which to report incidental take with Grant PUD. For example, the use of bull trout fishway counts may prove useful over the course of the new license term in determining the presence of take at the Project's two dams.

Strategy 2-8 (page 16) states: "If information shows that incidental take of bull trout occurs due to hydrologic variation impacts, Grant PUD in coordination with the USFWS, will develop a collaborative plan to minimize the effect (where reasonable and feasible) of such incidental take." The avenue in which this information is collected is not specified within this strategy. We suggest the possibility of Grant PUD conducting monitoring at specific areas within the action area to decipher the presence of any hydrologic variation on bull trout during appropriate seasonal timeframes.

PACIFIC LAMPREY MANAGEMENT PLAN:

Section 4.2.8 (page 14) involves an evaluation and efficacy of reducing fishway flows at night at Wanapum and Priest Rapids dams. Since bull trout migrate predominantly during the night time, we suggest that Grant PUD, in coordination with the Service and the Priest Rapids Fish Forum, examine all relevant data to ensure that a potential reduction in flow within the Priest Rapids Project fishways does not interfere with upstream bull trout passage at the Project.

Section 4.2.10 Regional Studies (page 14) describes a process in which Grant PUD would coordinate its information regarding lamprey with other entities involved in similar work. We also suggest that Grant PUD coordinate its radio-telemetry work with the Service's Fisheries Resource Office in Leavenworth, Washington once tagged individuals enter associated tributaries to assess the presence of any effects to Pacific lamprey spawning. Therefore, we suggest that the second sentence of this section to read in the following manner: "For instance, when fish tagged under Grant PUD studies or studies conducted by other entities enter the project area or associated tributaries, Grant PUD will conduct and participate in these studies by monitoring and reporting on movement of tagged individuals within and through the project area in addition to associated tributaries."

Protection, Mitigation, and Enhancement (PME) measure 4.3.1 Identification and Mitigation of Project Effects on Juvenile Pacific Lamprey (page 15) appears to be unclear in terms of which downstream passage alternatives will be available for juvenile lamprey. We recommend that PME 4.3.1 be divided into two measures which define: 1.) all current downstream passage alternatives for juvenile Pacific lamprey and 2.) identification of project effects on juvenile Pacific lamprey.

Section 4.4 Objective 4: Avoid and Mitigate Project Impacts on Rearing Habitat (page 16) entails the determination of juvenile lamprey presence/absence, habitat use, and relative abundance in the project area. We suggest adding a PME 4.4.2 which obligates Grant PUD, when feasible, to contribute towards restoration projects designed to provide benefits to Pacific lamprey. The Service would work with Grant PUD to determine the feasibility of this measure in addition to the scope of funds that would be contributed to this effort.

WHITE STURGEON MANAGEMENT PLAN:

In general, an important piece of information missing from this document is the upstream passage counts of white sturgeon through the Priest Rapids and Wanapum dams. Passage counts will provide context in terms of shaping Grant PUD's future implementation of the White Sturgeon Conservation Aquaculture Plan. In part, this information will assist in defining how white sturgeon utilize both of the Project's reservoirs.

Recently, Tribal entities have released numerous juvenile white sturgeon into the Rock Island reservoir. We suggest that Grant PUD reassess its current level of white sturgeon within the Wanapum and Priest Rapids reservoirs in order to fine-tune its current level of white sturgeon to be released into these reservoirs due to possible downstream migration of white sturgeon from the Rock Island Reservoir.

Biological objective #3 on page ii includes: "Adult and juvenile upstream and downstream migration: Provide safe, effective, and timely volitional passage, if reasonable and feasible passage means are developed." This objective appears to need clarification as white sturgeon already pass upstream through the existing upstream fishways at the Project.

PME #4 on page iii states that Grant PUD will: "Conduct tracking surveys of juvenile white sturgeon released with active tags as part of the supplementation program to determine emigration rates from Priest Rapids Project." We also suggest that Grant PUD consider a determination of immigration rates for white sturgeon for these assessments.

The Service appreciates the opportunity to comment on these respective plans. If Grant PUD requires clarification on these comments, please contact me at your earliest convenience.

Steve

****

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COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon, Suite 200, Portland, Oregon 97232 Telephone 503 238 0667
Fax 503 235 4228

September 17, 2008

Tom Dresser
Fish and Wildlife Manager
Public Utility District No. 2
Grant County
P.O. Box 878
Ephrata, WA 98823

RE: Comments on the Priest Rapids Project Lamprey Management Plan

Executive Summary

This section should be condensed to about 40% of its current length. Much of the text in this section would more appropriately be presented in the background section. A short history of the current dire status of lamprey is missing with historical counts at the Priest Rapids Project dams should be included up front, and actions others are taking in the Columbia Basin (i.e. Corps of Engineers, Portland General Electric, Columbia Basin Treaty tribes, USFWS Coastwide Lamprey Conservation Initiative, Columbia Basin Fish and Wildlife Authority's Lamprey Technical Working Group) to attempt to stop the steep decline should be described. Also the 2003 petition for ESA listing should be described in the Executive Summary. The long discourse of the impact of turbine intakes screen is not relevant to Project dams, so it should be minimized. There should be some short section of the ecological and cultural importance of lamprey in this section (see CRITFC 2008).

The biological objectives do not include potential impacts on adult lamprey spawning and incubation of juvenile lamprey in the Project area. It is important that this plan address these potential Project impacts on these important life history stages.

In general, Grant PUD's lamprey plan objectives and actions should follow the objectives and actions in the draft Tribal Pacific Lamprey Restoration Plan (CRITFC 2008).

The first PME should be modified from, "maintain adult fishways…" to "improve adult fishways.." The Nass et al. (2002) studies indicated a 30% and 51% adult lamprey passage efficiency at the Priest and Wanapum dam fishways. There is an obvious need to improve these passage efficiency rates.

The third PME on adult counting should be modified from, "continue to operate and maintain fish count systems…" to "improve fish count systems so that accurate 24 hour adult lamprey counts are maintained". There is a substantial discrepancy between McNary Dam and Priest

Rapids counts with McNary counts often far less than Priest Rapids counts. This discrepancy needs investigation and resolution.

PME number 11 calls for identification and mitigation for Project impacts in a timely manner, but no later than 10 years following license issuance. The current rate of decline (adult lamprey counts from 350,000-400,000 in 1960's and 1970's, 117,000 in 2002 to 14,000 in 2008 at Bonneville Dam) argues for much more action in a much shorter time frame than 10 years. Table 1 from CRITFC (2008) illustrates the severe declines.

Table 1. Recent adult lamprey counts at Corps and Mid-Columbia PUD dams

Year	McNary	Priest Rapids	Ice Harbor	Wells	Lower Granite
2000	1,281	1,468	315	NA	28
2001	2,539	1,624	203	261	27
2002	11,282	4,007	1,127	338	128
2003	13,325	4,339	1,702	1,408	282
2004	5,888	2,647	805	291	117
2005	4,158	2,598	461	212	40
2006	2,139	3,273	255	21	35
2007	3,389	3,419	288	32	34

Notably there are no objectives or action(s) in the draft management plan that addresses water quality impacts from the Project on lamprey. Lamprey are extremely sensitive to olfactory stimuli and toxic studies indicate that they tend to accumulate toxics to a much greater extent than salmonids due to the extended freshwater history of lamprey and their physiological foundation. It is widely believed that adult lamprey home to areas where juvenile lamprey release pheremones (CRITFC 2008). Interruption of these migratory cues by point or non-point source pollutants could reduce adult lamprey ability to successfully spawn. Tribal members that eat lamprey for cultural and or subsistence values thus are at increased risk of diseases. The plan needs to contain actions and studies that investigate Project water quality impacts on lamprey.

1.0 Background

Much of the information in this section needs to be updated to reflect the current lamprey science in the Columbia Basin. The draft Tribal Pacific Lamprey Restoration Plan contains much updated information that should be useful here. It needs to be stated that adult and juvenile passage impediments at dams was identified as a key factor limiting Columbia Basin lamprey populations (CRITFC 2008).

3rd Paragraph Adult dam counts, including the Snake River and Upper Columbia dams should be updated to 2008 to show the dramatic decline in lamprey abundance since 2004.

1.3 Population status

The statement that adult lamprey counts at Priest Rapids dam have "increased steadily" over the last 10 years is not accurate. Counts since 2004 have ranged from 5,888 in 2004 to 2,139 in 2006. Also, it is incorrect to characterize these counts as "a real increase in the number passing Priest Rapids dam". Counts at the Priest Rapids fish counting station do not necessarily mean that adults are successfully passing through the dam. These statements give the impression that lamprey are doing fine at the Project when they are actually in serious decline and passage efficiencies based upon Nass et al. (2002) at the Project need to be significantly improved to meet regional goals of 80% per dam passage efficiency.

1.4 Previous studies

This section needs updating. There has been considerable more recent lamprey passage work in the Columbia Basin that is relevant to this plan and actions taken to improve lamprey passage at the Project. Again see CRITFC (2008).

2.0 Evaluation of Project effects on Juvenile Lamprey

The first sentence in the third paragraph should be deleted. While there have been laboratory tests to simulate turbine impacts to lamprey, actual turbine studies with lamprey have yet to be conducted.

The fourth paragraph needs to be modified to reflect data from Moursund et al. (2003 in CRITFC 2008) who, through underwater camera work, found that many lamprey enter turbines at the upper portion of the intake and fyke data obtained from Priest Rapids Dam that shows uniform vertical distribution of juvenile lamprey entering into the turbines (Carlson 1995 unpublished data in CRITFC 2008) and uniform vertical impingement of juvenile lamprey on vertical barrier screens (Starke and Dalen 1995 in CRITFC 2008).

No studies have been conducted for impacts to juvenile lamprey from passing through Wanapum new turbines. Thus, it is speculative to state that the new turbine design at Wanapum will inadvertently reduce impacts to juvenile lamprey.

3.0 Protection, Mitigation and Enhancement Measures

Objective 4 should be expanded to "…. Avoid and mitigation Project impacts to spawning, incubation and rearing." The plan should state that studies to evaluate these impacts will be conducted in the first three years following license issuance.

4.2.1 Maintain Adult Fishways

The PRFF should have an early opportunity each year to comment on a draft annual Fishway operations plan so that changes in the plan can be implemented in a timely fashion.

4.2.2 Develop Adult Passage Criteria

Due to their difference in physiology, body shape and locomotion, lamprey are different than salmon and have different passage requirements. Thus, consistency with salmon passage requirements may not be helpful for lamprey.

4.2.3 Adult Fish Count Systems

Grant PUD should install a half duplex PIT-Tag detection system at the entrance and exits of the Priest and Wanapum fishways this winter. Because PIT-Tags are much smaller than radio tags and thus have less of an impact on adult lamprey, they are being used extensively at Corps dams in the Columbia and Snake rivers. Installation of these system at Priest and Wanapum will allow for detection of lamprey tagged at downstream dams and create timing and efficiency data sets to serve as a baseline and to evaluate structural and operational passage improvements.

4.2.4 Junction Pool and Diffusion Grating Improvements

Grant should replace all 1 inch diffusion grating with ¾ inch diffusion grating so that lamprey cannot be trapped below diffuser gratings. This is being implemented at Corps dams after research indicated it was a successful fishway passage improvement (CRITFC 2008). Plates along the fishway wall may be helpful but ramps over submerged orifaces and rounded, smooth corners and small concrete piers that break up velocity barriers that lamprey may attach themselves to at orifaces and junction pools are likely important improvements shown to be successful at downstream dams (CRITFC 2008; Moser and Peery et al. 2008). Also, not mentioned in the draft plan, Lamprey Passage Systems (LPS) which are steel boxes placed in areas where lamprey congregate have demonstrated great passage success at Corps dams and should be considered for implementation in the Priest and Wanapum fishways.

4.2.7 Evaluation of Modification of Fishways

The plan should require an initial inspection of the Priest and Wanapum fishways with the PRFF and noted lamprey research experts during the winter 2008-09 dewatering period to visually identify passage barriers and recommend solutions to these barriers. A written report should be distributed to the PRFF following the inspection for review and comment and then finalized as part of the final management plan.

4.2.10 Regional Studies

Due to the severe decline of lamprey throughout the Columbia Basin, other entities, such as the Corps of Engineers are aggressively pursuing adult and juvenile passage research, while other entities, such as the Columbia Basin treaty tribes and the USFWS are conducting lamprey habitat surveys. Juvenile lamprey tag development is also being accelerated (Peery et al. 2008) as is genetics and translocation research and there in much interest in developing a lamprey aquaculture facility. The final management plan for this Project needs to reflect on Grant's commitment and obligations to use this research, testing and information on an expedited basis to meet the Project lamprey plan's goals of no-net impact to lamprey populations from the Project.

Schedule of Plan Actions

Just today CRITFC received a table from Grant PUD on actions and schedule for implementation of actions. Yet, today, Grant is calling for a deadline of comments on the entire draft management plan. We have looked at Grant's table and while we appreciate the effort in constructing it, we would like more details flushed out with respect to specific actions and time frames. For example, the table has a date for the initial inspection of the Project fishways for passage barriers on 11/09. This is a very important first step action that should be conducted this winter of 2008-09. We offer the following action implementation schedules that we developed for the Corps dams in our tribal lamprey restoration plan (CRITFC 2008) as a template that we recommend Grant adopt and modify for the final Priest Rapids Project Plan.

Table 2. Specific Actions and Schedules for Adult Lamprey at Federal Dams

ACTIONS AND SCHEDULE FOR FEDERAL DAM IMPROVEMENTS	BONN DAM	THE DALLES DAM	JOHN DAY DAM	MCNARY DAM	ICE HARBOR DAM	LOWER MONUMENTAL DAM	LITTLE GOOSE DAM	LOWER GRANITE DAM
Survey Fishways	2009	2009	2009	2009	2009	2009	2009	2009
Peer-reviewed reports	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018
Annual Inspection Protocols/Reports	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009	2009
Prioritization	2009-2018	2010	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-18
Grating Replacement	2009-2012	2012	2010	2011	2012	2012	2012	2012
24 hour Video Counting	2008-2018	2008-2018	2008-2018	2008-2018	2009-2018	2009-2018	2009-18	2018
Reduce Fishway Night Flows	2009-2018	2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-18	2009-18
Rounding Corners	2009-2012	2012	2011	2011	2012	2012	2012	2012
Plate installations	2009-2010	2012	2010	2010	2012	2010	2010	2010
Ramp Installations	2012	2012	2012	2012	2012	2012	2012	2012
Ladder Dewatering Improvements	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018	2009-2018
Fishway Entrance Improvements	2009-2012	2012	2010	2011-2013	2011-2013	2011-2013	2011-13	2011-2013
LPS installations and evaluations	2009-2011	2012	2010	2011	2012	2013	2013	2013

Table 3. Summary of Juvenile Passage and Mainstem Habitat Actions

Action	Schedule	Benefit
Expedite development of juvenile lamprey tagging technology and support regional research	2008-2012	Enable acquisition of baseline and post action data to gauge impacts and monitor and evaluate mitigation actions
Use existing tagging technology and other tools to determine dam impacts on juvenile lamprey	2008-2010	Establish baseline data for impacts in near term
Survey reservoirs for juveniles and rearing habitat	2009-2012	Determine presence and absence of juveniles
Implement improved flow regimes	2009-2018	Reduce fish travel time and increase survival
Develop route specific dam passage and survival estimates	2009-2018	Establish baseline information for improvements
Remove or modify turbine intake screens that cause impingement	McNary 2009; Snake River dams 2010	Reduce juvenile direct mortality
Assess impacts of irrigation screens and tributary blockages and make improvements	2009-2018	Reduce juvenile mortality
Determine water quality impacts and seek improvements	2009-2018	Reduce juvenile mortality
Create annual peer-reviewed progress reports	2009-2018	Reduce juvenile mortality

Summary

CRITFC appreciates the opportunity to comment on Grant PUD's draft lamprey management plan for the Priest Rapids Project. While the draft is a good start, we recommend significant changes as stated above to be included in the final version. Due to the severe recent declines of lamprey in the Project area and basinwide, management plan objectives and actions need to be expanded and expedited in order to prevent extirpation of this species that is vital to the ecological framework in the Columbia Basin. Should you have questions regarding these comments please contact me directly.

Sincerely,
/s/
Robert Heinith
Hydro Program Coordinator

Cc: PRFF

References

CRITFC (Columbia River Inter-Tribal Fish Commission). 2008. Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin. Formal Draft. CRITFC. Portland, Oregon.

Moser, M.L. and C. A. Peery. 2008. Improving adult Pacific lamprey passage and survival at Lower Columbia River dams- 2009. Study Code ADS-P-00-8. To Corps of Engineers. Portland Oregon.

Peery, C.A., M. Delwiche and F. Loge. 2008. Development of design criteria for a functional juvenile Pacific Lamprey active tag. Study Code LMP-08-02 and SPE-06-2. To Corps Engineers. Walla Walla, WA.

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Northwest Regional Office
911 N.E. 11th Avenue
Portland, Oregon 97232-4169

IN REPLY REFER TO:

TAKE PRIDE IN AMERICA

September 18, 2008

Memorandum

To: Manager, Fish, Wildlife, and Water Quality
Public Utility District No. 2 of Grant County, Washington
(Tom Dresser)

From: Hydropower Program Manager, Bureau of Indian Affairs /s/ Bob Dach

Subject: Comments on the Pacific Lamprey Management Plan – Priest Rapids Hydroelectric Project (FERC No. 2114)

Thank you for the opportunity to review your draft Pacific Lamprey Management Plan (Plan). As you know, the Bureau of Indian Affairs (BIA) is keenly interested in improving conditions for lamprey at all Columbia River projects and we appreciate your efforts to implement passage improvement measures as expeditiously as possible.

In general, the Plan should build upon information previously presented by Grant PUD and others, state specifically how the Biological Objectives and Implementation Measures identified in your Water Quality Certification will be met, and identify specific measures and step by step timelines for addressing lamprey passage issues already identified at the Priest Rapids Hydroelectric Project (Project). As it is, the Plan does little more than consolidate information existing prior to 2005 with the verbatim terms of your Certification.

We note that the Certification states specifically that the Plan shall include "but not be limited to" the identified Implementation Measures and that the required comprehensive evaluation - to be developed and implemented within one year of license issuance (item 2) d)) - is specifically to identify data gaps "not captured in the adult lamprey passage evaluation completed by Grant PUD as part of its FLA proposal." The following assessments of your fish ladders were developed during your licensing process (Nass et al. 2003), identified in your Final License Application (FLA), and again presented in you Plan:

1. The physical attributes and high velocity of fish ladder entrances may exceed lamprey swimming ability;
2. Transitional areas such as the attraction channel, collection channel and junction pool may have hydraulic conditions that impede upstream movement;
3. The attraction water supply channel and water supply conduit may cause false attraction where diffusion gratings make up the entire flooring in specific areas of the fish ladders;

4. Count stations at Priest Rapids and Wanapum have weirs or board spacing that allow lamprey to pass the count boards or the video count windows undetected. This may cause delay and also biases lamprey counts low; and
5. High velocities through the fish ladders may delay migration because these velocities may exceed lamprey swimming ability.

Given that we are currently aware of these problems, the Plan should, at a minimum, identify specific physical and operational modifications, and associated implementation schedules, to address each of these five items over the next two to three years. Where specific measures are not currently available, a process and schedule for evaluating prototype modifications should be identified.

To this end, it would be helpful if the complete list of modifications proposed in the FLA was included in the plan. We could then see which of the five items identified above were being addressed and which needed further attention. For example, modifications proposed for the junction pool and diffuser gratings (Plan section 4.2.5) would appear to at least partially address items 2 and 3, but we are unaware of any other specific measures being proposed for implementation by Grant PUD over the next two to three years that would address the other known fishway problems.

Various fishway modifications intended to facilitate lamprey passage have been evaluated at other Columbia River projects and many are applicable to the problems identified at your Project. We refer you to the "Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin" developed by the Nez Perce, Umatilla, Yakama and Warm Springs Tribes for an up to date list of proven technologies that can be used to address known passage issues in your fishways.

In exchange for implementing these fishway modifications over the next two to three years, we recommend, and would like to discuss further, the possibility of delaying the Comprehensive Passage Evaluation until year four, and to combine that evaluation with the evaluations required under sections 2) f), g) and h). This would greatly expedite implementation of needed improvements and reduce Grant's study costs significantly. The resulting information could be used to identify any additional tweaks that may be necessary and used to develop new Project specific passage criteria, by approximately year 6.

We appreciate the step-wise process required by the Certification, but are not convinced that additional adult lamprey passage studies will provide any new substantive information, unless these studies are designed to evaluate specific operational and physical modifications implemented at the Project.

We look forward to discussing these comments at the PRFF and suggest that the draft Plan be modified and provided for additional comments by the PRFF before being finalized. If you have any questions, please contact me at Robert.Dach@bia.gov or at 503-231-6711.

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

August 13, 2008

Mr. Tom Dresser, Manager
Fish, Wildlife, and Water Quality
Public Utility District No. 2 of Grant County
Post Office Box 878
Ephrata, Washington 98823

Dear Tom:

Thank you for the opportunity to provide comments on three draft management plans associated with the requirements of the Priest Rapids Project License: lamprey, white sturgeon, and bull trout. Washington Department of Fish and Wildlife (WDFW) has reviewed these drafts and offers the following comments.

Pacific Lamprey Management Plan

The draft plan is consistent with the plans put forth by Chelan and Douglas County Public Utility Districts (PUDs) and, in general, seems ready for filing with the Federal Energy Regulatory Commission (FERC) and the Washington Department of Ecology (Ecology), with a couple of areas that could be improved.

1. WDFW is concerned that the only modification to the fish ladders that is specifically described in the draft is installation of diffuser gratings in problem areas. We support diffuser grating installation, but are concerned that there are no plans to address problems with the entranceways (section 2.0), even though the plan acknowledges the need for improvements. We note that Grant PUD proposes using 1/4" grating (section 4.2.5). Recent literature[1] indicates 3/4" grating may work, and might be less prone to clogging. We suggest some additional investigation on appropriate grating size.

2. The schedule for investigating nighttime reduction of flows delays those investigations until after the evaluation of diffuser gratings installation. Recent literature[2] indicates reduction of nighttime flows may be the most significant modification method for increasing passage success.

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[1] Moser, M.L., H. T. Pennington and J.M. Roos. 2007. Grating size needed to protect adult Pacific lamprey in the Columbia River Basin. Report to U.S. Army Corps of Engineers. Portland, OR. Contract E96950021

[2] Daigle, W.R., C.A. Peery, S.R. Lee and M.L. Moser. 2005. Evaluation of adult Pacific lamprey passage and behavior in an experimental fishway at Bonneville Dam. Idaho Cooperative Fish and Wildlife Research Unit for U.S. Army Corp of Engineers and Bonneville Power Administration. Technical Report 2005-1.

WDFW urges Grant PUD to investigate nighttime flow modification sooner than called for in this draft, although that likely involves simultaneous evaluation of the diffuser gratings and flow modifications. The Comprehensive Passage Evaluation (section 4.2.4) should be designed to allow for evaluation of both passage improvements.

White Sturgeon Management Plan

This draft White Sturgeon Management Plan (WSMP) is lacking many important specifics, making it quite difficult to evaluate the plan. WDFW does not believe that this plan is adequate for filing with FERC or Ecology at this point. In particular, the draft WSMP lacks the level of detail needed to properly review and comment on two important sub-components: 1) a breeding plan, including associated matting schemes, and 2) the monitoring and evaluation sampling plan. A second key area that needs rectifying is the outdated perspective used in Appendix A (it was essentially cut and pasted from a previous draft document without updating).

Breeding Plan:

1. The draft WSMP, as presented, lacks a "breeding plan" component. Instead, the plan states "Grant PUD, in consultation with the PRFF, will prepare a broodstock collection and breeding plan within year one of the effective date of the New License" (page 16).
2. A breeding plan is one of the core components to any hatchery supplementation program and as such, should be presented for review up front along with the rest of the WSMP. At stake is an assurance that the hatchery supplementation program minimizes the likelihood of inbreeding by utilizing a mating scheme that maximizes the genetic effective population size of the hatchery-produced fish.
3. Earlier, Grant PUD distributed a June 2004 draft of a conservation aquaculture plan that included the material contained in Appendix A of the current draft WSMP. Section 2.5.5 (pages 35-49) of that document, entitled "White Sturgeon (*Acipenser transmontanus*) Conservation Aquaculture Plan for Priest Rapids and Wanapum Reservoirs, Mid-Columbia River", contained a detailed treatment of a breeding plan approach. The approach was based on strategies developed for the Kootenai White Sturgeon Recovery Plan and further refined for the Upper Columbia White Sturgeon Recovery Initiative. Grant PUD removed the section describing the breeding plan when it transferred the material to Appendix A.

What are the reasons for removing the breeding plan component from Appendix A? We understand that both the Kootenai and Upper Columbia plans have been reworked to accommodate new information and analysis through an adaptive process and that any plan should be a living document in order to stay abreast of the state of the science. Nevertheless, the WSMP needs at least a conceptual breeding plan component to assure.

accommodate both fall Chinook and sturgeon culture at that location.

Section 2.2 (Outstanding Issues Requiring Resolution) needs to be updated. For example, the regulatory agencies made their objectives clear during the relicensing process.

Bull Trout Monitoring and Evaluation Plan

The plan appears consistent with license requirements and 401 requirements. In regards to ESA requirements, WDFW will defer to judgments from the U.S. Fish and Wildlife Service. We do offer a few suggestions on the text, largely concerning the lack of any real data on bull trout usage of project waters and interpretations that rest on that absence of data. For instance, in the studies and evaluation portion (4.1.1 on p. 6), the draft concludes that no mortalities of tagged bull trout were documented at Priest Rapids or Wanapum. This conclusion appears to be based on the only fish observed passing the project, which was a single mort, so no firm conclusions are possible.

The draft uses the term "consider" in reference to assessing passage when a "sufficient sample size can be acquired" (6.2 strategy 2-2, p 15). Yet, the 401 language specifies that Grant PUD shall " identify any adverse...effects on ....passage" (5.2 Task 2 p 13). Further, the draft should provide guidance concerning "sufficient sample size"; WDFW could not find any guidance on that subject in this draft.

Thank you for the opportunity to review these draft plans, please contact me should you have any questions regarding our review.

Sincerely,

Bill Tweit, Columbia River/Distant Waters Policy Lead
Intergovernmental Resource Management

cc: Priest Rapids Fish Forum
D. Marcie Mangold, Ecology

Appendix C
Grant PUD's Response to Agency and Tribal Comments

GRANT PUD'S RESPONSE TO AGENCY AND TRIBAL COMMENTS FOR THE PACIFIC LAMPREY MANAGEMENT PLAN

Submitting Entity	Date Received	Paragraph #	Agency Comment	Grant PUD Response
USFWS	25-Jul-08	1	Section 4.2.8 (page 14) involves an evaluation and efficacy of reducing fishway flows at night at Wanapum and Priest Rapids dams. Since bull trout migrate predominantly during the night time, we suggest that Grant PUD, in coordination with the Service and the Priest Rapids Fish Forum, examine all relevant data to ensure that a potential reduction in flow within the Priest Rapids Project fishways does not interfere with upstream bull trout passage at the Project.	Comment noted.
		2	Section 4.2.10 Regional Studies (page 14) describes a process in which Grant PUD would coordinate its information regarding lamprey with other entities involved in similar work. We also suggest that Grant PUD coordinate its radio-telemetry work with the Service's Fisheries Resource Office in Leavenworth, Washington once tagged individuals enter associated tributaries to assess the presence of any effects to Pacific lamprey spawning. Therefore, we suggest that the second sentence of this section to read in the following manner: "For instance, when fish tagged under Grant PUD studies or studies conducted by other entities enter the project area or associated tributaries, Grant PUD will conduct and participate in these studies by monitoring and reporting on movement of tagged individuals within and through the project area in addition to associated tributaries."	Comment noted. Section 4.2.10 has been modified to include "…monitoring and reporting of information related to the movement of tagged lamprey (tagged under other evaluations) through the Project facilities and the Project area and providing access to the adult fishways or other Project facilities (e.g. adult salmonids off-ladder fish trap) for the collection of lamprey for regional research purposes…."
		3	Protection, Mitigation, and Enhancement (PME) measure 4.3.1 Identification and Mitigation of Project Effects on Juvenile Pacific Lamprey (page 15) appears to be unclear in terms of which downstream passage alternatives will be available for juvenile lamprey. We recommend that PME 4.3.1 be divided into two measures which define: 1.) all current downstream passage alternatives for juvenile Pacific lamprey and 2.) identification of project effects on juvenile Pacific lamprey.	The 401 Certificate issued for the Priest Rapids Project specifically states that Grant PUD will *"In a timely manner, but no later than 10 years following license issuance, identify and mitigate Project effects on juvenile Pacific lamprey with the intention of meeting juvenile lamprey passage criteria…"*
		4	Section 4.4 Objective 4: Avoid and Mitigate Project Impacts on Rearing Habitat (page 16) entails the determination of juvenile lamprey presence/absence, habitat use, and relative abundance in the project area. We suggest adding a PME 4.4.2 which obligates Grant PUD, when feasible; to contribute towards restoration projects designed to provide benefits to Pacific lamprey. The Service would work with Grant PUD to determine the feasibility of this measure in addition to the scope of funds that would be contributed to this effort.	Grant PUD respectively disagrees with the USFWS assertion that PME 4.4 obligates Grant PUD to contribute funds for restoration projects designed to benefit Pacific lamprey. At this time no information exists, nor has the USFWS provided information that indicates that the Priest Rapids Project impacts juvenile lamprey and/or rearing habitat. Juvenile lamprey presence/absence, habitat use,

				relative abundance, and potential impacts to juvenile rearing habitat would be assessed under Section 4.4, Objective 4, which is consistent with the 401 Certification. The 401 Certification specifically requires Grant PUD to first *"In a timely manner, but no later than 10 years following license issuance, Grant PUD will determine juvenile Pacific lamprey presence/absence, habitat use, and relative abundance within the Priest Rapids Project."*
USFWS	17-Sep-08 (email from S. Lewis to Mike Clement)	1	Thanks for allowing us to provide comments on this plan. After further digestion of this plan, I have additional comments related to this plan. My specific concerns are related to adult lamprey passage at the two projects. I'm thinking that Grant PUD already has a good chunk of telemetry data available at their disposal and this data points to specific corrective measures. On a similar note, we all know that there are commonalities associated with improving adult lamprey passage at various hydroelectric projects. Why not simply implement the measures within the first 2-3 years of the new license versus conducting additional studies that will cost additional money to Grant PUD?? Plating at Priest Rapids and rounded corners/reduction in fishway flows at Wanapum?? I think the current language unfortunately gets us into an endless cycle of conducting literature reviews and examining data?? I don't think this approach is captured in the current version of the plan. Please digest this concept and let's talk when you get chance.	Within the Pacific Lamprey Management Plan, Grant PUD is proposing to install diffusion plating in the fishways prior to conducting a telemetry evaluation to assess the improvements. This assessment would also be used to identity other specific areas in the fishways that impede adult lamprey passage. A specific study plan to assess adult lamprey passage in areas where modifications to the diffusion gratings have been made would be developed through consultation with the Priest Rapids Fish Forum.
WDFW	13-Aug-08	1	Thank you for the opportunity to provide comments on three draft management plans associated with the requirements of the Priest Rapids Project License; lamprey, white sturgeon, and bull trout. Washington Department of Fish and Wildlife (WDFW) has reviewed these drafts and offers the following comments.	Comment noted.
		2	Pacific Lamprey Management Plan – The draft plan is consistent with the plans put forth by Chelan and Douglas County Public Utility Districts (PUD's) and, in general, seems ready for filing with the Federal Energy Regulatory Commission (FERC) and the Washington Department of Ecology (Ecology), with a couple of areas that could be improved.	Comment noted.
		3	1. WDFW is concerned that the only modification to the fish ladders that is specifically described in the draft is installation of diffuser grating in problem areas. We support diffuser grating installation, but are concerned that there are no plans to address problems with the entranceways (section 2.0), even though the plan acknowledges the need for improvements. We note that Grant PUD proposes using ¼" grating (section 4.2.5). Recent literature (Moser et. al. 2007) indicates	Telemetry results from Nass et. al. (2003) conducted at Priest Rapids and Wanapum dams concluded that the entranceways at both dams were not identified as problematic areas for adult lamprey. Further, the COE is currently experimenting with Grant PUD's entrance design for passage improvement at McNary and John

			¾" grating may work, and might be less prone to clogging. We suggest some additional investigation on appropriate grating size.	Day dams. It appears that WDFW has incorrectly referenced "…using ¼" grating." The reference of ¼" is the thickness measurement of the plating Grant PUD is purposing to utilize for the diffuser plating, not the diffuser grating itself.
		4	2. The schedule for investigating nighttime reduction of flow delays those investigations until after the evaluation of diffuser grating installation. Recent literature (Daigle et. al 2005) indicates reduction of nighttime flows may be the most significant modification method for increasing passage success. WDFW urges Grant PUD to investigate nighttime flow modifications sooner that called for in this draft, although that likely involves simultaneous evaluation of the diffuser gratings and flow modifications. The Comprehensive Passage Evaluation (section 4.2.4) should be designed to allow for evaluation of both passage improvements.	The reduction of nighttime flows will be evaluated during the adult passage evaluation. Grant PUD would work in consultation with the Priest Rapids Fish Forum to develop a study plan for this evaluation. Grant PUD has included an implementation schedule in the Pacific Lamprey Management Plan.
BIA	06-Aug-08	PRFF Discussion	Suggest that implementation timelines to be included in management plans.	Grant PUD has developed a comprehensive implementation schedule and included it as Appendix A of the Pacific Lamprey Management Plan.
BIA	15-Sep-08	1	Comment: Grant PUD will outline tasks and estimate timelines of the Lamprey Management Plan in a draft proposal. The PRFF will be asked to review all draft objective plans and estimated implementation dates.	See Comment above.
BIA	18-Sep-08	1	In general, the Plan should build upon information previously presented by Grant PUD and others, state specifically how the Biological Objectives and Implementation Measures identified in your Water Quality Certification will be met, and identify specific measures and step by step timelines for addressing lamprey passage issues already identified at the Priest Rapids Hydroelectric Project (Project). As it is, the Plan does little more than consolidate information existing prior to 2005 with the verbatim terms of your Certification.	Grant PUD has developed a comprehensive implementation schedule and included it as Appendix A of the Pacific Lamprey Management Plan.
		2	We note that the Certification states specifically that the Plan shall include "but not be limited to" the identified Implementation Measures and that the required comprehensive evaluation - to be developed and implemented within one year of license issuance (item 2) d)) - is specifically to identify data gaps "not captured in the adult lamprey passage evaluation completed by Grant PUD as part of its FLA proposal." The following assessments of your fish ladders were developed during your licensing process (Nass et al. 2003), identified in your Final License Application (FLA), and again presented in your Plan:	Comment Noted. Grant PUD generally agrees with this statement and notes that based on the findings of previous telemetry evaluations by Nass et. al (2003) and measures required within the 401 Certification (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will both significantly improve adult lamprey passage at Priest Rapids and Wanapum dams and meet those objectives and goals for upstream passage as identified in the Pacific Lamprey Management

			1. The physical attributes and high velocity of fish ladder entrances may exceed lamprey swimming ability; 2. Transitional areas such as the attraction channel, collection channel and junction pool may have hydraulic conditions that impede upstream movement; 3. The attraction water supply channel and water supply conduit may cause false attraction where diffusion gratings make up the entire flooring in specific areas of the fish ladders; 4. Count stations at Priest Rapids and Wanapum have weirs or board spacing that allow lamprey to pass the count boards or the video count windows undetected. This may cause delay and also biases lamprey counts low; and 5. High velocities through the fish ladders may delay migration because these velocities may exceed lamprey swimming ability. Given that we are currently aware of these problems, the Plan should, at a minimum, identify specific physical and operational modifications, and associated implementation schedules, to address each of these five items over the next two to three years. Where specific measures are not currently available, a process and schedule for evaluating prototype modifications should be identified.	Plan for the Priest Rapids Project.
		3	To this end, it would be helpful if the complete list of modifications proposed in the FLA was included in the plan. We could then see which of the five items identified above were being addressed and which needed further attention. For example, modifications proposed for the junction pool and diffuser gratings (Plan section 4.2.5) would appear to at least partially address items 2 and 3, but we are unaware of any other specific measures being proposed for implementation by Grant PUD over the next two to three years that would address the other known fishway problems.	See previous comment.
		4	Various fishway modifications intended to facilitate lamprey passage have been evaluated at other Columbia River projects and many are applicable to the problems identified at your Project. We refer you to the "Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin" developed by the Nez Perce, Umatilla, Yakama and Warm Springs Tribes for an up to date list of proven technologies that can be used to address known passage issues in your fishways.	Comment noted. Grant PUD's proposed fishway modifications are based on proven Pacific lamprey passage methodologies developed, tested, and accepted throughout the Columbia Basin and on the physical attributes of the Priest Rapids and Wanapum fishways and the telemetry results of previous studies by Nass et. al. (2003). Grant PUD believes that the modification included in the 401 Certification and in this Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will significantly improve adult lamprey passage at Priest Rapids and Wanapum dams. Grant PUD believes that a future telemetry

				evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project.
		5	In exchange for implementing these fishway modifications over the next two to three years, we recommend, and would like to discuss further, the possibility of delaying the Comprehensive Passage Evaluation until year four, and to combine that evaluation with the evaluations required under sections 2) f), g) and h). This would greatly expedite implementation of needed improvements and reduce Grant's study costs significantly. The resulting information could be used to identify any additional tweaks that may be necessary and used to develop new Project specific passage criteria, by approximately year 6.	Comment noted.
		6	We appreciate the step-wise process required by the Certification, but are not convinced that additional adult lamprey passage studies will provide any new substantive information, unless these studies are designed to evaluate specific operational and physical modifications implemented at the Project.	Future telemetry evaluations to determine operational and physical modifications of the fishways at the Priest Rapids Project will be developed in consultation with the PRFF. Grant PUD believes that a future telemetry evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project.
Yakama Nation	03-Sep-08	PRFF Discussion	Yakama Nation requested that because the Lamprey Management Plan objectives are similar between Grant PUD, Chelan PUD, and Douglas PUD that they work together with the Yakama Nation (YN) to implement a regional schedule for the Tribal Lamprey Recovery Plan.	Comment noted. Grant PUD is required to "participate and cooperate in regional lamprey forums" as identified in Section 4.2.10 of the Pacific Lamprey Management Plan for the Priest Rapids Project.
CRITFC	17-Sep-08	1	This section should be condensed to about 40% of its current length. Much of the text in this section would more appropriately be presented in the background section. A short history of the current dire status of lamprey is missing with historical counts at the Priest Rapids Project dams should be included up front, and actions others are taking in the Columbia Basin (i.e. Corps of Engineers, Portland General Electric, Columbia Basin Treaty tribes, USFWS Coastwide Lamprey Conservation Initiative, Columbia Basin Fish and Wildlife Authority's Lamprey Technical Working Group) to attempt to stop the steep decline should be described. Also the 2003 petition for ESA listing	Based on this comment, Grant PUD has modified the executive summary and introduction sections of the Pacific Lamprey Management Plan.

			should be described in the Executive Summary. The long discourse of the impact of turbine intakes screen is not relevant to Project dams, so it should be minimized. There should be some short section of the ecological and cultural importance of lamprey in this section (see CRITFC 2008).	
		2	The biological objectives do not include potential impacts on adult lamprey spawning and incubation of juvenile lamprey in the Project area. It is important that this plan address these potential Project impacts on these important life history stages.	Grant PUD is unaware of any documentation or previous studies that suggest that Pacific lamprey spawning occurs in the Priest Rapids Project. Previous studies (Nass et. al. 2003) did not document adult use of any tributaries that enter into the Project reservoirs and best available science related to Pacific lamprey life history and preferred habitat suggests that Project tributaries are not suitable for Pacific lamprey spawning and rearing.
		3	In general, Grant PUD's lamprey plan objectives and actions should follow the objectives and actions in the draft Tribal Pacific Lamprey Restoration Plan (CRITFC 2008).	The Pacific Lamprey Management Plan developed by Grant PUD is consistent with the requirements identified in Water Quality 401 Certification issued April 3, 2007 and amended on March 6, 2008 by Washington Department of Ecology under authority of the Clean Water Act for compliance with State water quality standards. Furthermore, Grant PUD believes many of the goals and objectives of the Pacific Lamprey Management Plan for the Priest Rapids Project are consistent with the objectives in the draft Tribal Pacific Lamprey Restoration Plan.
		4	The first PME should be modified from, "maintain adult fishways…" to "improve adult fishways.." The Nass et al. (2002) studies indicated a 30% and 51% adult lamprey passage efficiency at the Priest and Wanapum dam fishways. There is an obvious need to improve these passage efficiency rates.	Grant PUD believes that modifications proposed in the Pacific Lamprey Management Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) is the first step in improving adult lamprey passage at Priest Rapids and Wanapum dams.
		5	The third PME on adult counting should be modified from, "continue to operate and maintain fish count systems…" to "improve fish count systems so that accurate 24 hour adult lamprey counts are maintained". There is a substantial discrepancy between McNary Dam and Priest Rapids counts with McNary counts often far less than Priest Rapids counts. This discrepancy needs investigation and resolution.	Grant PUD agrees that it is difficult to maintain accurate Pacific lamprey counts at mainstem dams based on inconsistent counting methodologies between dams, the potential for overwintering between dams, changes in personnel, and counting station passage efficiency (the ability of count station equipment to force individuals through a counting area for

				observation). Grant PUD currently provides 24-hour fish counts at both dams, 7 days per week. Based on design of the Video Fish Count System at Priest Rapids Dam all lamprey are passed through an orifice where they are counted.
		6	PME number 11 calls for identification and mitigation for Project impacts in a timely manner, but no later than 10 years following license issuance. The current rate of decline (adult lamprey counts from 350,000-400,000 in 1960's and 1970's, 117,000 in 2002 to 14,000 in 2008 at Bonneville Dam) argues for much more action in a much shorter time frame than 10 years.	Comment noted. Grant PUD believes the proposed fishway improvements included in the Pacific Lamprey Management Plan for the Priest Rapids Project will be addressed during the first 2 to 3 years, following PRFF, Ecology, and FERC's approval of the Plan.
		7	Notably there are no objectives or action(s) in the draft management plan that addresses water quality impacts from the Project on lamprey. Lamprey are extremely sensitive to olfactory stimuli and toxic studies indicate that they tend to accumulate toxics to a much greater extent than salmonids due to the extended freshwater history of lamprey and their physiological foundation. It is widely believed that adult lamprey home to areas where juvenile lamprey release pheremones (CRITFC 2008). Interruption of these migratory cues by point or non-point source pollutants could reduce adult lamprey ability to successfully spawn. Tribal members that eat lamprey for cultural and or subsistence values thus are at increased risk of diseases. The plan needs to contain actions and studies that investigate Project water quality impacts on lamprey.	Grant PUD will continue to work toward meeting water quality requirements as identified in the Water Quality 401 Certification issued April 3, 2007 and amended on March 6, 2008 by Washington Department of Ecology under authority of the Clean Water Act for compliance with State water quality standards.
		8	Much of the information in this section needs to be updated to reflect the current lamprey science in the Columbia Basin. The draft Tribal Pacific Lamprey Restoration Plan contains much updated information that should be useful here. It needs to be stated that adult and juvenile passage impediments at dams was identified as a key factor limiting Columbia Basin lamprey populations (CRITFC 2008).	Comment noted. Grant PUD's proposed fishway modifications are based on proven Pacific lamprey passage methodologies developed, tested, and accepted throughout the Columbia Basin and on the physical attributes of the Priest Rapids and Wanapum fishways and the telemetry results of previous studies by Nass et. al. (2003). Grant PUD believes that the modification included in the 401 Certification and in this Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will significantly improve adult lamprey passage at Priest Rapids and Wanapum dams. Grant PUD believes that a future telemetry evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum

				dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project.
		9	Adult dam counts, including the Snake River and Upper Columbia dams should be updated to 2008 to show the dramatic decline in lamprey abundance since 2004.	Comment noted. Section 1.3 has been edited to reflect more recent count information.
		10	The statement that adult lamprey counts at Priest Rapids dam have "increased steadily" over the last 10 years is not accurate. Counts since 2004 have ranged from 5,888 in 2004 to 2,139 in 2006. Also, it is incorrect to characterize these counts as "a real increase in the number passing Priest Rapids dam". Counts at the Priest Rapids fish counting station do not necessarily mean that adults are successfully passing through the dam. These statements give the impression that lamprey are doing fine at the Project when they are actually in serious decline and passage efficiencies based upon Nass et al. (2002) at the Project need to be significantly improved to meet regional goals of 80% per dam passage efficiency.	Comment noted.
		11	This section needs updating. There has been considerable more recent lamprey passage work in the Columbia Basin that is relevant to this plan and actions taken to improve lamprey passage at the Project. Again see CRITFC (2008).	Comment noted. Grant PUD's proposed fishway modifications are based on proven Pacific lamprey passage methodologies developed, tested, and accepted throughout the Columbia Basin and on the physical attributes of the Priest Rapids and Wanapum fishways and the telemetry results of previous studies by Nass et. al. (2003). Grant PUD believes that the modification included in the 401 Certification and in this Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will significantly improve adult lamprey passage at Priest Rapids and Wanapum dams. Grant PUD believes that a future telemetry evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project.
		12	The first sentence in the third paragraph should be deleted. While here have been laboratory tests to simulate turbine impacts to lamprey, actual turbine studies with lamprey have yet to be conducted. The fourth paragraph needs to be modified to reflect data from Moursund et	Grant PUD believes that impacts to juvenile lamprey survival at the Priest Rapids Project is limited, as Wanapum nor Priest Rapids dams do not have deflector screens in front of the turbine

			al. (2003 in CRITFC 2008) who, through underwater camera work, found that many lamprey enter turbines at the upper portion of the intake and fyke data obtained from Priest Rapids Dam that shows uniform vertical distribution of juvenile lamprey entering into the turbines (Carlson 1995 unpublished data in CRITFC 2008) and uniform vertical impingement of juvenile lamprey on vertical barrier screens (Starke and Dalen 1995 in CRITFC 2008). No studies have been conducted for impacts to juvenile lamprey from passing through Wanapum new turbines. Thus, it is speculative to state that the new turbine design at Wanapum will inadvertently reduce impacts to juvenile lamprey.	intakes and bypass structures such as the Wanapum Future Unit Fish Bypass provide a non-mechanical passage route through for juvenile lamprey. Grant PUD has modified the following sentence to read as follows; "The new design incorporates several features to reduce impacts to juvenile salmonids which could reduce impacts to juvenile lamprey, this includes such things as a minimum gate runner at all operating conditions (spiral hub) to reduce gaps, redesign of stay vanes (hydraulically designed), reducing the overhang of the wicket gates, and re-design of the draft tube, which has reduced tailrace egress conditions."
		13	Objective 4 should be expanded to "…. Avoid and mitigation Project impacts to spawning, incubation and rearing." The plan should state that studies to evaluate these impacts will be conducted in the first three years following license issuance.	Grant PUD believes that the modification included in the 401 Certification and in this Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will significantly improve adult lamprey passage at Priest Rapids and Wanapum dams. Grant PUD believes that a future telemetry evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project.
		14	The PRFF should have an early opportunity each year to comment on a draft annual Fishway operations plan so that changes in the plan can be implemented in a timely fashion.	Comment noted.
		15	Due to their difference in physiology, body shape and locomotion, lamprey are different than salmon and have different passage requirements. Thus, consistency with salmon passage requirements may not be helpful for lamprey.	Comment noted.
		16	Grant PUD should install a half duplex PIT-Tag detection system at the entrance and exits of the Priest and Wanapum fishways this winter. Because PIT-Tags are much smaller than radio tags and thus have less of an impact on adult lamprey, they are being used extensively at Corps dams in the Columbia and Snake rivers. Installation of these system at Priest and Wanapum will allow for detection of lamprey	Grant PUD has worked cooperatively with University of Idaho (U of I) to install half duplex PIT-tag systems near both entrances at Priest Rapids Dam. Installation of half duplex PIT-tag systems near the fish ladder exits is not possible because Grant PUD currently maintains full-

			tagged at downstream dams and create timing and efficiency data sets to serve as a baseline and to evaluate structural and operational passage improvements.	duplex PIT-tag readers in that vicinity which will create interference, rendering both systems inoperable.
		17	Grant should replace all 1 inch diffusion grating with ¾ inch diffusion grating so that lamprey cannot be trapped below diffuser gratings. This is being implemented at Corps dams after research indicated it was a successful fishway passage improvement (CRITFC 2008). Plates along the fishway wall may be helpful but ramps over submerged orifaces and rounded, smooth corners and small concrete piers that break up velocity barriers that lamprey may attach themselves to at orifaces and junction pools are likely important improvements shown to be successful at downstream dams (CRITFC 2008; Moser and Peery et al. 2008). Also, not mentioned in the draft plan, Lamprey Passage Systems (LPS) which are steel boxes placed in areas where lamprey congregate have demonstrated great passage success at Corps dams and should be considered for implementation in the Priest and Wanapum fishways.	Grant PUD believes that the modification included in the 401 Certification and in this Plan (i.e., installation of diffuser plating, reduction of nighttime fishway flows, removal of count board count stations, etc.) will significantly improve adult lamprey passage at Priest Rapids and Wanapum dams. Grant PUD believes that a future telemetry evaluation will determine if the modifications to the fishways were successful at improving adult lamprey passage at Priest Rapids and Wanapum dams and meeting the objectives and goals for upstream passage as identified in the Pacific Lamprey Management Plan for the Priest Rapids Project. Telemetry evaluation(s) to assess the improvements made to diffuser gratings would also be used to identity other specific areas in the fishways that impede adult lamprey passage. Grant PUD agrees that the Lamprey Passage System (LPS) appears to successfully collect lamprey at Corps dams where lamprey concentrations occur; however based on previous telemetry studies (Nass et. al. 2003) and observations current information suggests that adult lamprey are not concentrating in specific areas of the fishways at Priest Rapids or Wanapum dams.
		18	The plan should require an initial inspection of the Priest and Wanapum fishways with the PRFF and noted lamprey research experts during the winter 2008-09 dewatering period to visually identify passage barriers and recommend solutions to these barriers. A written report should be distributed to the PRFF following the inspection for review and comment and then finalized as part of the final management plan.	Grant PUD has incorporated this request on behalf of the Priest Rapids Fish Forum into the Pacific Lamprey Management Plan Schedule included in Appendix A of the Plan. The results of the fishway inspection will be included in annual summary reports required in the Plan.
		19	Due to the severe decline of lamprey throughout the Columbia Basin, other entities, such as the Corps of Engineers are aggressively pursuing adult and juvenile passage research, while other entities, such as the Columbia Basin treaty tribes and the USFWS are conducting lamprey habitat surveys. Juvenile lamprey tag development	Grant PUD believes the Biological Objectives, Goals, and Protection, Mitigation, and Enhancement Measures, included in the Pacific Lamprey Management Plan for the Priest Rapids Project, which is consistent with the requirements

			is also being accelerated (Peery et al. 2008) as is genetics and translocation research and there in much interest in developing a lamprey aquaculture facility. The final management plan for this Project needs to reflect on Grant's commitment and obligations to use this research, testing and information on an expedited basis to meet the Project lamprey plan's goals of no-net impact to lamprey populations from the Project.	of the 401 Certification, provides a framework of adaptive management and would incorporate new information and technology.
		20	Just today CRITFC received a table from Grant PUD on actions and schedule for implementation of actions. Yet, today, Grant is calling for a deadline of comments on the entire draft management plan. We have looked at Grant's table and while we appreciate the effort in constructing it, we would like more details flushed out with respect to specific actions and time frames. For example, the table has a date for the initial inspection of the Project fishways for passage barriers on 11/09. This is a very important first step action that should be conducted this winter of 2008-09. We offer the following action implementation schedules that we developed for the Corps dams in our tribal lamprey restoration plan (CRITFC 2008) as a template that we recommend Grant adopt and modify for the final Priest Rapids Project Plan.	Comment noted. The implementation schedule was recommended by the Priest Rapids Fish Forum and has been included as an Appendix. The implementation schedule has been edited to reflect CRITFC's comment.
		21	CRITFC appreciates the opportunity to comment on Grant PUD's draft lamprey management plan for the Priest Rapids Project. While the draft is a good start, we recommend significant changes as stated above to be included in the final version. Due to the severe recent declines of lamprey in the Project area and basinwide, management plan objectives and actions need to be expanded and expedited in order to prevent extirpation of this species that is vital to the ecological framework in the Columbia Basin. Should you have questions regarding these comments please contact me directly.	Comment noted.
Wanapum	01-Oct-08	1	The Wanapum appreciate the opportunity to comment on the Pacific Lamprey Management Plan and have the following comments. Pacific Lamprey is an important cultural resource to the Wanapum. Traditionally, past and presently, Wanapum gathered Pacific Lamprey in the Priest Rapids Project area and the Columbia Basin. More recently, Wanapum gathered Pacific Lamprey at the Priest Rapids Dam left and right bank fish ladder. The Wanapum are concerned with the current state of the Pacific Lamprey populations rapid decline. The Wanapum are interested and will actively participate in regional recovery efforts of Pacific Lamprey including Priest Rapids Project efforts. Wanapum are interested in a risk assessment performed on Wanapum consumption of Pacific Lamprey that nest and incubate in the Priest Rapids Project area and areas of lamprey enhancement	Comment noted. Grant PUD appreciates the comments submitted by the Wanapum and looks forward to future discussions related to the Pacific Lamprey Management Plan for the Priest Rapids Project with the Wanapum and Priest Rapids Fish Forum.

			through regional efforts. Wanapum concerns stem from Pacific Lamprey nesting and incubating in the PRP area and proposed recovery efforts that are exposed to a higher concentration of sediment pollution and contamination. There are various factors that would contribute to more sediment pollution and contamination on Pacific Lamprey in the area compared to other areas along the Columbia River, including agricultural run-off and Hanford Reach seepage and run-off. Wanapum wish to actively participate in any future measures, studies, investigations and discussions made in an effort to address the proper course for Pacific Lamprey restoration that moves towards establishing a healthy stock capable to support traditional Wanapum gathering. We look forward to working with you on those efforts.	
CRITFC	05-Jan-09	1	Executive Summary-The overall combined goal of the plan as stated in the 401 Cert is to achieve No Net Impact (NNI). "Identify, address and fully mitigate Project effects to the extent reasonable and feasible". This needs to be clarified in the ES.	Grant PUD has modified the Executive Summary to reflect this recommendation.
		2	The tasks 1-4 in the 401 cert are important and should be listed in the ES.	Grant PUD has modified the Executive Summary to reflect this recommendation.
		3	There is no mention or addressing of water quality issues and their potential effect on lamprey in the project area in the plan. These include temperature, DO and toxics that might be released from the projects. The plan needs to have a section that addresses these issues- these are important for the 401 cert.	Grant PUD will continue to work toward meeting water quality requirements as identified in the Water Quality 401 Certification issued April 3, 2007 and amended on March 6, 2008 by Washington Department of Ecology under authority of the Clean Water Act for compliance with State water quality standards. Based on this comment, Grant PUD has included information related to meeting water quality requirements in Section 1.3 of the PLMP.
		4	Page 1.0 Background. Para 3 The greatest lamprey decline has occurred at the upper Columbia Projects, not above the SR dams. The existing statement needs to be corrected.	Grant PUD has modified Page 1.0, paragraph 3 to reflect this recommendation.
		5	Para 5 Lamprey "migrate" to many locations. Available information indicates that there is not a stock specific lamprey population structure, so the concept of lamprey "straying" from natal areas is speculative.	Grant PUD has modified Page 1.0, paragraph 5 to reflect this recommendation.
		6	Page 2 Para 4 Other than in specific, local high velocity areas such as fishway entrances, Lamprey are good swimmers. Telemetry studies show that they can migrate 10-15 Km or more in a single day. The existing statement should be modified.	Grant PUD has modified Page 2.0, paragraph 4 to reflect this recommendation.
		7	Page 5, 1.3. The lack of ammocetes in surveys in the Snake Basin and upper Columbia area is also a clear indication of decline of lamprey populations, besides adult dam counts.	Grant PUD has included information relative to Snake River juvenile abundance on Page 5.0, Section 1.3, paragraph 3.
		8	Page 7 Para 2 While tagging and handling may have some impact on	Telemetry results from Nass et. al. (2003)

			migration from release to detection at the first dam, the low numbers of adults entering the PR fishway indicate that there are likely structural passage issues at PR. Moser et al. (2002) cited that 88-90% of lamprey, trapped, radio tagged (some with large tags and some with smaller tags) and released below Bonneville dam were detected at the dam fishway and the relatively fast median travel times for these fish indicated little to no handling effects. This is by far a much higher fidelity rate that that for lamprey back to Priest Rapids.	conducted at Priest Rapids and Wanapum dams concluded that the entranceways at both dams were not identified as problematic areas for adult lamprey. Further, the COE is currently experimenting with Grant PUD's entrance design for passage improvement at McNary, John Day, and Bonneville dams. Based on this comment, additional information describing fishway entrance weirs has been included on Page 16, Section 4.2.8, paragraph 1.
		9	Page 9 Para 2 There have never been direct and indirect mortality studies conducted for juvenile lamprey passing through turbines so it cannot be stated that passage through turbines does not cause mortality	Grant PUD has modified Page 9.0. paragraph 2 to reflect this recommendation.
		10	Page 11 Para 1 The goal of the PLMP is NNI.	Grant PUD has modified Page 11.0, paragraph 1 to reflect this recommendation.
		11	Pages 12-15 These are tasks, not objectives per the 401 cert.	Grant PUD has modified Pages 12 – 15 to reflect this recommendation.
		12	Pages 14-15 Not clear whether the entrance velocity of 6 fps will be maintained at night or reduced for lamprey passage to meet the 2.8 fps range.	Future telemetry evaluations to determine operational and physical modifications of the fishways including the reduction of fishway flows at the Priest Rapids Project will be developed in consultation with the PRFF.
		13	Page 15 Section 4.2.10 Regional studies. Should include adult lamprey supplementation of upstream areas as a regional study use. Criteria for the best extant adult passage at CR mainstem dams (about 80%) should be the initial target and should be stated in the plan.	Grant PUD strongly disagrees with CRITFC's recommendation that a dam passage effectiveness of 80% be unilaterally applied to all Projects/facilities. Grant PUD believes that this illustrates a lack of understanding that each facility may have site specific constraints and issues.
		14	Grant should establish half duplex PIT-detection capability at Wanapum as well as Priest Rapids to gain information about passage times and success of lamprey tagged for regional studies as well as project specific studies.	Future telemetry evaluations to determine operational and physical modifications of the fishways including the use of half-duplex PIT-tag detection at Wanapum Dam will be developed in consultation with the PRFF.
		15	Page 19 Para 1 It is not know how the future bypass system will work for lamprey so it should be stated that we hope it works but it might not and some other passage alternative may be necessary.	Grant PUD has modified Page 20.0, paragraph 1 to reflect that recommendation.

		16	Page 19 Para 2. Until juvenile passage studies have been conducted through project downstream passage routes criteria will not be able to be established. This should be stated in the plan.	Grant PUD has modified Page 20.0, paragraph 2 to reflect this recommendation.
		17	4.3.3 Plan should also include Grant's participation and regional collaboration for development of juvenile tagging technologies necessary to determine project impacts on juvenile lamprey.	Grant PUD strongly disagrees with the CRITFC assertion that the PLMP should obligate Grant PUD to contribute funds for development of juvenile tagging technologies to determine Project impacts on juvenile lamprey At this time no information exists, nor has the CRITFC provided information that indicates that the Priest Rapids Project impacts juvenile lamprey and/or rearing habitat.
		18	There should be a table of biological objectives, actions, schedules and benefits provided for juvenile lamprey as well as adults in the plan (see Table 3 in CRITFC Sept 17, 2008 comments).	Tables 5, Page 18, and Table 6, Page 19, both include biological objectives, actions, and schedules related to juvenile lamprey.