TACOMA POWER
TACOMA PUBLIC UTILITIES

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June 17, 2008

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Re: City of Tacoma, Cowlitz River Project, FERC No. 2016
Settlement Agreement License Article 8 Disease Management Plan

Dear Ms. Bose:

Settlement Agreement License Article 8 requires Tacoma Power to submit a Disease Management Plan within five years license issuance. By letter dated September 26, 2003, FERC established July 18, 2003, as both the effective and issuance date of the license. Attached is the Disease Management Plan submitted to fulfill that requirement.

The Washington Department of Fish and Wildlife assisted Tacoma Power in the preparation of this plan. A draft of the attached plan was provided to the members of Fisheries Technical Committee for a 30-day review period. No comments on the final plan were received.

If you have any questions regarding this submittal, please do not hesitate to contact Debbie Young, Natural Resource Manager, at (253) 502-8340 or Tom Martin, License Implementation Coordinator, at (253) 502-8298.

Sincerely,

Patrick D. McCarty
Generation Manager

Enclosures

Cc: Federal Energy Regulatory Commission, Portland Regional Office (w/attachment)
Erich Gaedeke, Federal Energy Regulatory Commission, Portland Office (w/attachment)
Fisheries Technical Committee (w/attachment)
Larry Durham, Washington Department of Fish and Wildlife (w/attachment)
Debbie Young (w/attachment)
Tom Martin (w/attachment)

City of Tacoma,
Department of Public Utilities, Light Division
Cowlitz River Project
FERC No. 2016

Settlement Agreement License Article 8

Fish Disease Management Plan

1. INTRODUCTION

This plan is prepared in compliance with the requirements of Settlement Agreement License Article 8, contained in Appendix A of the Federal Energy Regulatory Commission's (the Commission) Order Approving Settlement and Issuing New License for FERC Project No. 2016, issued and effective July 18, 2003. The license article requires the City of Tacoma, Department of Public Utilities, Light Division (Tacoma Power) to develop and file a fish Disease Management Plan within five (5) years of license issuance.

1.1. PROJECT DESCRIPTION

The Cowlitz Project (FERC No. 2016) is Tacoma Power's largest electricity generating facility and is located on the Cowlitz River, Lewis County, Washington. The Project consists of two dams, the Mayfield Dam at river mile (RM) 52 and Mossyrock Dam, upstream at RM 65. In addition to the project generating electricity and providing flood control, Tacoma operates 3 major parks, manages approximately 14,000 acres of wildlife lands, and owns and funds operation of the Cowlitz Salmon Hatchery (RM 50) and the Cowlitz Trout Hatchery (RM 42). The Barrier Dam, associated with the Cowlitz Salmon Hatchery is located at RM 49.5. The original 50-year license for the Cowlitz Project was issued on December 28, 1951. A new thirty-five year license was issued and became effective on July 18, 2003.

The Mayfield development completed in 1963 includes a 250-foot-high, 850-foot-long, concrete arch and gravity dam that impounds Mayfield Lake, which has a maximum surface area of 2, 250 acres. In addition to the Cowlitz River, inflows from the Tilton River also contribute to Mayfield Lake, which supports public and private recreational facilities. An 854-foot-long power tunnel passes through the right abutment of the dam and terminates at a concrete forebay structure. Four penstocks continue from the forebay structure to the four generating units, which have an installed capacity of 162-megawatts (MW).

The Mossyrock development completed in 1968 includes a 606-foot-high double curvature concrete arch dam that creates Riffe Lake, a 23-mile long, 11,830-acre reservoir with 52 miles of shoreline. Riffe Lake supports several parks and other recreational facilities. Three penstocks, varying in length from 248 to 285 feet, extend down to the powerhouse, which is adjacent to the base of the dam. The powerhouse contains two generating units with room for a third, and has a total installed capacity of 300 MW. Transmission lines link the Mossyrock and Mayfield developments.

1.2. FERC LICENSE

Article 8. Disease Management Plan

Within five (5) years of license issuance, the Licensee shall submit a Fisheries Disease Management Plan that defines an acceptable level of risk from Ceratomyxa shasta) and other diseases, and allows adult fish to be upstream of Barrier Dam. The Fisheries Disease Management Plan shall be designed to allow an appropriate level of pathogens. The plan shall include criteria for determining success or failure, as well as a review every five (5) years to see that the criteria for success are being met and a procedure and schedule for amending the plan if the criteria are not met. Plan amendments could include, but not be limited to: changes in the Fisheries and Hatchery Management Plan and changes to the hatchery water quality and/or quantity. The Licensee shall consult with fish pathology experts from the National Marine Fisheries Service, U.S. Fish and Wildlife Service and Washington Department of Fish and Wildlife and shall prepare the plan in collaboration with the Fisheries Technical Committee provided for in the August 2000 Settlement Agreement, or if the Settlement Agreement has become void, with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife and Washington Department of Ecology (referred to as "the FTC or agencies"). When a draft plan has been prepared, it shall be provided to all affected agencies and Tribes for 30-day review and comment. The Licensee shall include with the final plan documentation of consultation and copies of comments and recommendations, and specific descriptions of how the final plan accommodates all comments and recommendations. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission. Following Commission approval, the plan becomes a requirement of the license, enforceable by the Commission.

2. OBJECTIVES

To provide a fish disease management plan for the fisheries mitigation activities associated with the Cowlitz Hydroelectric Project, specifically adult and juvenile salmonid fish passage, hatchery production and fish stocking activities in the Cowlitz River basin above the mouth of the Toutle River.

3. PLAN

Introduction: Adult salmonids have been and continue to be placed into the Cowlitz River upstream from the Barrier Dam; the plan shall define an acceptable level of risk from pathogens endemic to the Cowlitz drainage. This plan will be structured to minimize the disease risk from the introduction of fish into the upper Cowlitz drainage.

The Salmonid Disease Control Policy of the Co-Managers of Washington State (SDCP)of 2006 dictates that all co-manager or co-operator hatchery facilities within Washington state develop an exotic pathogen management plan to notify, contain, and mitigate circumstances where exotic pathogens are isolated. The Cowlitz Disease Management Plan will therefore include management for pathogens endemic to the Cowlitz drainage, and monitoring efforts to determine the presence of exotic pathogens potentially introduced into the Cowlitz drainage. The plan will also list the required steps that will be taken in order to transfer fish or eggs out of the Cowlitz drainage, and the reporting procedure for notification of new findings.
The SDCP details the required sampling levels for reportable pathogens that will be carried out on all Cowlitz River stocks. The policy also states the required reporting procedures when pathogens are detected in the stocks. The SDCP also specifies the required sampling levels

needed for transfers of fish and/or eggs into or out of the Cowlitz River drainage. The Cowlitz Fish Disease Management Plan will follow all requirements set forth in the WSCSDP.

There are currently three fish rearing facilities in the Cowlitz drainage operated by the Washington Department of Fish and Wildlife (WDFW). They are the Cowlitz Trout Hatchery, the Cowlitz Salmon Hatchery and the Mossyrock Trout Hatchery. The Mossyrock Trout Hatchery is state funded and has no brood stock. It rears rainbow, brown and cutthroat trout plantings primarily into lakes and streams in an area designated by WDFW as region 5. The Mossyrock facility can be affected by findings within the Cowlitz drainage.

Pathogens endemic to the Cowlitz drainage that have little or no control or effective treatment include Infectious Hematopoietic Necrosis Virus (IHNV), Bacterial Kidney Disease (BKD) and the myxosporidian parasite ***Ceratomyxa shasta***. Exotic pathogens of concern addressed in this plan include but are not limited to Oncorhynchus Masou Virus (OMV), European Viral Hemorrhagic Septicemia virus (VHSV) and the myxosporidian parasite ***Myxobolus cerebralis***, the causative agent of whirling disease. Other salmonid pathogens not listed above are considered to be well established in the Cowlitz drainage and will be present in the system regardless of fish management activities. Salmonid pathogens in the Cowlitz drainage that have effective treatment and or control methods will not be included in this document. A list of fish pathogens isolated or detected in the Cowlitz River to date is listed in the Appendix.

The disease management plan will allow acceptable levels of risk from pathogens when adult salmonids are placed upstream of the Barrier Dam. (The phrase “upstream of the Barrier Dam” needs clarification.) A management strategy will be described for IHNV, BKD and *C. shasta* in this document. A risk assessment for the pathogens listed above is currently being developed. It will be included in this management plan as a blank form in an appendix. The most current version of the risk assessment indicates a risk level to be used as a tool for fish management decisions. The risk assessment is included in the appendix.

The FERC license calls for the inclusion of criteria for determining success or failure. The ambiguity of these terms makes this a difficult goal to interpret. Examples of “failure” in a hatchery may include an inability to achieve program production goals consistently from year to year. It may include the inability to reach egg allotment goals, if a particular brood stock perishes as a result of diseases in the hatchery prior to spawning. Again, this would have to occur on a regular basis for the term “failure” to apply. (The final draft may include more specific information, such as failure to reach program goals by a certain percentage in three out of four years, or four out of five years in a stock is considered to be a failure.)

Success or failure in the natural origin fish is also difficult to evaluate based solely on fish pathogens or disease. The term “failure” could be used if emigrating smolts from the upper watershed are perishing at a high daily percentage and a fish pathogen is directly causing the mortality. Failure to achieve a large naturally occurring population of endemic salmonids should not result in changes to the disease management plan unless the lack of success is directly attributed to fish pathogen(s).

Section 1: Pathogens of Concern in the Cowlitz drainage and their current management strategies

Part A: INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS (IHNV)

On the Cowlitz River, IHNV is most commonly associated with steelhead adults. It is occasionally found in both fall and spring Chinook adults. The virus poses a significant threat to juvenile steelhead reared at the Cowlitz Trout Hatchery. Cowlitz River late winter steelhead are generally 100% positive for the virus when sampled during spawning at the Cowlitz Trout Hatchery. The short period of time that they are held prior to spawning indicates that the fish are positive for the virus when they arrive at the barrier dam and/or hatchery. These fish are transferred to the upper Cowlitz River tributaries in an effort to increase the naturally spawning population. Use of the risk assessment model currently being developed in a joint effort by WDFW and Northwest Indian Fish Commission (NWIFC) shows that the risk level for this type of transfer is moderate to high.

Factors which lower the risk level from “high” to “moderate” include the very large reservoirs on the Cowlitz, the protected water supplies at the hatcheries and the fact that fish in the upper Cowlitz have already been found to be positive for the virus. The large volume of Riffe Lake helps to dilute the pathogen because of its immense size. Pathogens being shed into the upper end of the reservoir would have to remain viable for weeks or even months before they get into Mayfield Lake. Transfer of fish pathogens via the water is unlikely. However, a live host will be able to move the pathogens from the upper end of Riffe Lake to the lower end. An argument could be made that these fish would serve as a vector to transmit the pathogen downstream to the hatchery, but the likelihood of this would not be any higher than the adult salmonids present in the Cowlitz River below the Barrier Dam.

Little is known about the effects of IHNV on wild fish populations. The virus is an obvious threat to steelhead hatcheries because of the much higher rearing densities in the facilities. It has been well established that for a disease to occur, there needs to be a combination of factors that include a susceptible host, a virulent pathogen, and a stressful environment. The natural environment is not as stressful as the hatchery environment, so one could assume that there would be a lower risk of an epizootic in a natural population. Individual fish may succumb to a disease, but an epizootic would not happen unless a significant stressor was placed upon the wild population. It would seem plausible that IHNV has less of an impact on wild populations than on hatchery populations. However, this has not yet been demonstrated.

Protection of the hatchery water supply from exposure to IHNV is imperative. Although the plant was not designed to protect against IHNV the ozone disinfection system at the Cowlitz Trout Hatchery has proven to be effective when the plant is operating correctly. Unfortunately, viral outbreaks have occurred in 2002, 2004, 2005 and in December 2006 to 2007, and three of the four outbreaks were linked to inadequate disinfection of the incoming water. (Historical records show IHNV outbreaks occurred in 1981, 1982, 1987, 1988, 1990, and 1994 juvenile steelhead at the Cowlitz Trout Hatchery. The ozone system was installed in 1990 to 1991, and was first fully operational in 1991.)

The third factor reducing the risk level from high to moderate is the fact that IHNV is already established in the Cowlitz drainage. If no steelhead were transported to the upper Cowlitz drainage, there would still be fish with the virus present in the river above the Cowlitz Trout Hatchery and below the Barrier Dam.

The protected water supply of the Cowlitz Trout Hatchery, the presence of virus in the immediate water supply, and the large dilution factor of both Riffe and Mayfield lakes allow for the transfer of adult steelhead to the upper Cowlitz tributaries for potentially establishing and

enhancing the natural origin steelhead population. Monitoring smolts that leave the system would be an important method to determine if this introduction is increasing the prevalence of IHNV in the watershed. To do this, fresh mortalities could be sampled at regular intervals over an extended period of time. This would entail the collection of kidney and spleen tissues and having standardized viral testing conducted on them. Only fish that have died during the collection and transfer process would be used for testing. No healthy steelhead smolts would be sacrificed for disease sampling. It seems unlikely that the number of fish tested would be higher than a few dozen per week. In many weeks no fish would be tested. The information gathered from this sampling could prove to be valuable in determining the impacts of pathogens on wild fish populations.

Management recommendations:

Monitor prevalence of IHNV in smolts that have died while being collected and transported below the Barrier Dam and Cowlitz Falls Collection Facility. Monitor prevalence of IHNV in smolts that have perished while being held at the Mayfield Dam smolt collection facility, and from the Cowlitz Falls Fish Collection Facility (CFFCF) to the Stress Relief Ponds at the Cowlitz Salmon Hatchery.

Monitor natural-origin steelhead smolt mortalities from the upper Cowlitz River basin that are transferred to and briefly held at the stress relief ponds at the Cowlitz Salmon Hatchery.

Avoid using steelhead adults for nutrient enhancement purposes unless the viral status is known. Freeze steelhead carcasses prior to nutrient enhancement if they are to be used.

Continue with the use of well water and ozone/ultra violet disinfected river water as long as possible during the rearing cycle of steelhead at both the Cowlitz Salmon Hatcheries and Cowlitz Trout Hatcheries. Make improvements and/or upgrades to the existing ozone disinfection system to better insure that IHNV is removed from the hatchery water supply.

Rear steelhead juveniles in pathogen-free water at the Cowlitz Salmon Hatchery before transferring to the Cowlitz Trout Hatchery for grow out and release.

Part B: BACTERIAL KIDNEY DISEASE

Renibacterium salmoninarum is a Gram positive diplobacillus that causes Bacterial Kidney Disease (BKD). In Cowlitz River hatcheries, yearling Chinook and coho that are being reared on untreated surface water have the highest potential for getting the disease. Occasional adults perish from BKD prior to spawning at the Cowlitz Salmon Hatchery. The disease is usually found to cause chronic mortality in fish approximately one year after hatching. The mortality can continue until release in March and April when they are 17 to 18 months old. Yearling coho have been found in some years to have BKD, and the loss at times reaches 0.1% per day in one or more raceways. In the Cowlitz drainage, Steelhead generally do not get BKD, but it has been found once in the past 15 years to be killing juvenile steelhead at the Beaver Creek Hatchery in southwest Washington. The risk of BKD causing mortality in steelhead is low.

Current management of the pathogen at the hatchery level includes the use of injectable erythromycin at 100 mg/kg into spring Chinook adults monthly prior to spawning. It also includes the use of erythromycin mixed with feed 2 or 3 times per year. Typically the feed is first given to spring Chinook juveniles 5 to 6 months after hatching and it is administered for 21 days at a dose of 100 mg/kg. The first feeding generally follows the mass marking (fin clipping)

process. It is then used a second time approximately 10 months after hatching. A third feeding has been used in years when BKD has been problematic (around 15 months post hatching), but is not used at this time. Both the injections and the feeding of erythromycin are prophylactic, and both treatments are being evaluated to improve effectiveness. The evaluation may result in a change in erythromycin use.

Fall Chinook adults are not injected with erythromycin, but are injected with a broader spectrum antibiotic (usually oxytetracycline) when they arrive at the hatchery. The fall Chinook progeny are not fed antibiotics prophylactically. The strategy for this is based on the run timing of the adults, and the sub-yearling release of the progeny. Fall Chinook adults generally come into the hatchery 2 to 6 weeks prior to spawning and it takes 4 to 6 weeks for ***R. salmoninarum*** to grow in laboratory conditions. It is assumed that the short holding period and the cooler water temperatures reduce the potential for ***R. salmoninarum*** to be found at detectable levels in the fall chinook adults. Historically, fall Chinook have a low prevalence of BKD when they are being spawned. The progeny are not fed the erythromycin because the fish are released in June and early July, when they have been reared for approximately 6 months at the time of release.

Coho adults are not injected with erythromycin prior to spawning. The juveniles are not fed erythromycin during their time at the hatchery because the species is generally refractive to ***R. salmoninarum***. In years when BKD is causing mortality, the loss is not a significant threat to production goals at the facility. Additionally, feeding antibiotics to large fish is not warranted because of low water temperatures and poor palatability, and a significant reduction in mortality is usually not observed.

BKD management includes spring Chinook adult sampling and segregation of progeny from the adults based on BKD antigen levels in the adults. In the hatchery, all female spring Chinook are sampled for BKD at the time of spawning. The enzyme linked immunosorbent assay (ELISA) is used to quantify the levels of BKD antigen in each fish. Test results are used by hatchery staff to segregate fish that come from adults with similar BKD levels. The different groups are reared in isolation from each other to the greatest degree possible. The WDFW uses 4 levels of BKD antigen prevalence. They are below low, low, moderate, and high, based on optical density thresholds from the ELISA test of 0.1, 0.2, 0.45, and greater than 0.45 respectively. Progeny that come from adults with high and moderate levels of BKD antigen are used for a sub yearling release into the upper Cowlitz tributaries. This strategy protects the hatchery fish from becoming infected by fish from adjacent raceways, but it may have some negative impact on the long-term disease management goals of the watershed. There is not a monitoring effort in place at this time to determine if smolts migrating from the upper Cowlitz have detectable BKD antigen in them. Monitoring smolts that perish during the collection and trucking process may be a useful way to determine if BKD is an issue in the upper Cowlitz supplementation program. If BKD is found in smolts migrating from the upper watershed, then the current management strategy described above should be modified.
In years when there is a very low percentage of adults that test positive for BKD, it would be sound disease management to place the sub yearling fish or fry below the hatchery in an area where Chinook historically survive. The fish will be marked so that they can be differentiated from natural origin Chinook in the river. Placing low numbers of eggs/fry downstream of the Cowlitz Salmon Hatchery will not impact any of the production goals for spring Chinook. This would prevent the potential transfer of ***R. salmoninarum*** into the hatchery water supply. It would also better protect the upper Cowlitz system from further introductions of ***R. salmoninarum***. At this time, the destruction of fish is not allowed because of House Bill 1286 passed by the Washington state legislature.

Management recommendations for BKD:

Monitor the prevalence of BKD antigen in dead and morbid Chinook smolts from the upper Cowlitz drainage by sampling them as they are collected at the Mayfield Dam and the upper Cowlitz Falls Collection Facility and/or the stress relief ponds at the Cowlitz Salmon Hatchery.

Evaluate the use of erythromycin in feed used in juvenile Chinook production at the Cowlitz Salmon Hatchery. Published data shows that erythromycin persists approximately 21 days inside the fish cells. The use of feed mixed with erythromycin should therefore coincide with the first findings of BKD in chinook at the Cowlitz Salmon Hatchery. Erythromycin should be used 10 to 14 days prior to the averaged first detection of ***R. salmoninarum*** in juveniles.
Explore new treatment methods and strategies that will improve fish health.

Manage the spring Chinook more effectively based on the ELISA sampling results from the brood. We may be allowed to spawn up to 10 percent additional eggs for potential destruction based on ELISA BKD levels. In years when there are too many adults testing at the moderate and high level, the first feeding of erythromycin will be administered before the fish are mass marked.

Part C: *Ceratomyxa shasta*

C. shasta is a myxozoan parasite that causes mortality primarily in juvenile steelhead and, to a lesser extent, Chinook juveniles in the Cowlitz River system. The organism has been found in Chinook and steelhead smolts emigrating from the Cowlitz system at the Mayfield trap. Catastrophic losses at the Cowlitz Trout Hatchery of 50% or more annually led to the installation of the ozone disinfection system that has been in use since 1991 to try and protect from *C. Shasta* losses. There is no cure or effective treatment for this parasitic disease, and the life cycle was only confirmed scientifically in the late 1990's. The ozone system at the Cowlitz Trout Hatchery has been effective in eliminating most mortality from the parasite. Occasional fish are positive for intestinal spores, but the losses associated with *C. shasta* are now minimal. The highest incidence of loss since 1991 happened in 2003 to 2004. It was determined that *C. shasta* caused more mortality during this time than the IHNV outbreak that initially occurred in the 2003 brood class of steelhead.

There are occasional years in which *C. shasta* has caused significant mortality in Chinook juveniles at the Cowlitz Salmon Hatchery. This happened most recently in 2004, 2005, and 2007. Mortality from *C. shasta* reached several thousand fish per day in some raceways in 2004 and 2005, and reached 0.1% daily loss in some raceways in 2007. The causes of the worst outbreaks at the salmon hatchery are not well understood, but may be linked to fin clipping of fish during June and July. It may also be linked to the lack of scouring in most of the Cowlitz drainage that enabled the intermediate host *Manawunkia speciosa*, a polycheate worm, to thrive. In 2006 and 2007, the Chinook were mass marked in March and April. *C. shasta* was found to be causing some mortality during late summer of 2006, but it was not found in the intestines of moribund fish during the winter and spring of 2006/2007. Total loss from *C. shasta* in the 2005 brood year during 2006 and 2007 was low. The parasite caused mortality in December, 2007 in the 2006 brood year. The parasite was not easily detected in November 2007 but became too numerous to count in mid December during the epizootic.

There is potential for increasing the distribution of *C. shasta* into the upper watershed with transfers of both live adults and carcasses for nutrient enhancement. The parasite seems to be well established, as it has been documented in smolts leaving the upper Cowlitz for a number of

years. Rainbow trout in net pens in Mayfield Lake have also developed the disease after being in the lake for only a few months. Freezing carcasses used for nutrient enhancement may eliminate the parasite, but there is mixed data showing that this may not be true. Management efforts to reduce or eliminate the parasite may have to focus on reduction of the intermediate host.

Management recommendations for *C. shasta*:

Continue monitoring parasite prevalence in smolts migrating from the upper watershed.

Explore alternate water supplies/treatment systems at the Cowlitz Salmon Hatchery for juvenile spring Chinook rearing.

Freeze carcasses used for nutrient enhancement to reduce parasite levels. (It is unclear at this time if freezing eliminates *C. shasta*. Some research indicates that it does, other research indicates that it doesn't. However, freezing is known to reduce virus titers significantly, and most likely lowers *C. shasta* levels as well.) We can delete this now, and implement it in 5 years when the plan is revised.

As a precaution, mass mark hatchery fish that are susceptible to *C. shasta* during periods of lower water temperature.

Continue with influent ozone disinfection at the Cowlitz Trout Hatchery.

Conduct benthic sampling in the Cowlitz watershed to determine where *M. speciosa* persists in high densities.

Determine if there are safe and effective ways to reduce *M. speciosa* populations.

Part D: BACTERIAL PATHOGENS RESISTANT TO ANTIBIOTICS

Occasionally a bacterial isolation is made in moribund fish that shows a lack of sensitivity to antimicrobial compounds commonly used in fish culture. Generally, mortality persists in the affected stock after one or more antibiotics have been used. The most recent examples of this in the Cowlitz drainage were in fall Chinook adults at the Cowlitz Salmon Hatchery in 2005 and in brown trout at the Mossyrock Hatchery in 2005 to 2006. In order to verify that a microbe is drug resistant, it needs to be isolated in pure culture and tested using standardized laboratory procedures. When this happens, a report is generated that shares the information with the fisheries co-managers of the state of Washington. The Cowlitz fish health lab is now capable of conducting drug sensitivity testing on bacterial isolates and will do so for most bacterial isolations from diseased or moribund fish. If a bacterial pathogen is resistant to antibiotics, the SDCP will be followed.

Part E: EXOTIC REGULATED PATHOGENS

Whirling disease, Oncorhynchus Masou Virus (OMV), European Viral Hemorrhagic Septicemia Virus (VHSV), and other pathogens not yet found in the Cowlitz drainage can be detected using regular monitoring of salmonid stocks. Adult sampling is a method that can determine the presence of exotic pathogens in Cowlitz system. Sampling of smolts from both the hatchery

and natural origin fish is another way to detect exotic pathogens. Less likely is the possibility that a disease outbreak will occur that is caused by an exotic pathogen. If an exotic pathogen is found on the Cowlitz, it will most likely have come in from the adults migrating into the system. It can also be introduced into the Cowlitz by fish and/or egg transfers to private hatcheries, or by unsuspecting fishermen that may release fish from other drainages into the Cowlitz system.

In the event that an exotic regulated pathogen is found in a Cowlitz River salmonid stock, a containment plan must be put into effect, according to the SDCP. Containment plans can include but are not limited to quarantine, which includes the disinfection of effluent leaving the rearing vessel, destruction of the stock, or even destruction of the entire hatchery population. Rapid identification, reporting, and communication are vital to minimizing the amplification and transmission when (if) an exotic pathogen is found. Detailed containment plans are now required by the Salmonid Disease Policy, but they are not yet completed for the three hatcheries on the Cowlitz drainage. The plans will be completed shortly.

Part F: ACCEPTABLE LEVELS OF RISK

Risk evaluation of fish pathogens and disease has not been formerly conducted for the Cowlitz River basin. Determination of an "acceptable" level of risk is somewhat ambiguous. It would be difficult to define "acceptable level of risk" in a policy. Salmonid adults with all of the pathogens discussed above are being transported to the upper Cowlitz Basin. Because of this practice, it is most likely that the risk to hatchery populations is higher than the risk to natural origin fish because of the higher rearing densities that are found in the hatchery environment. Stress is a factor required for disease outbreaks. Hatchery populations are exposed to chronic stress throughout their rearing cycle and there is potential for disease outbreaks during any part of the hatchery rearing. Wild populations are faced with more acute forms of stress such as catastrophic floods, landslides, and gas super saturation due to the release of water from dams. Disease outbreaks can also occur in wild salmonids, but they are not as common.

Management strategies for protecting hatchery fish are outlined above. Monitoring of migrating natural origin fish by sampling moribund/freshly dead smolts at the two collection facilities and in the stress relief raceways at the Cowlitz Salmon Hatchery will help assess the affects of this management plan.

Section 2: Nutrient Enhancement in the Cowlitz River basin

The deliberate distribution of adult salmonid carcasses into watersheds for the purpose of nutrient enhancement can pose fish health risks if not properly managed. Disease organisms present in salmon carcasses can be transmitted to other salmonids following the release of these organisms into water or through their direct consumption. Salmon carcass transfer requirements are detailed in SDCP. Salmon carcass transfers are managed to minimize the fish health risk posed by carcass transfers through restricting their transfers within and between watersheds. Factors that will be taken into consideration in determining the restrictions include:

> The pathogen status of the broodstock and the watershed (current and historical). The regulated pathogen of concern (IHNV, Infectious Pancreatic Necrosis Virus (IPNV), North American Viral Hemorrhagic Septicemia Virus (N.A. VHSV), or *M. cerebralis*). The susceptibility of the species to be transferred to a regulated pathogen.

Minimum requirements for broodstock used for nutrient enhancement purposes:

The broodstock must have survived to spawn or have been killed as excess broodstock and, the broodstock must have met the required withdrawal time (e.g. as required by the FDA or prescribing veterinarian) for antibiotic use.

All pre-spawning mortalities (including their eggs) and adults that have not met the required withdrawal time (e.g. as required by the FDA or prescribing veterinarian) can not be used for nutrient enhancement purposes and must be disposed of in a way that prevents pathogens from getting back into State waters. Acceptable disposal methods include but are not limited to burial, composting, or rendering.

A new detection of a reportable pathogen in a broodstock that is to be transferred to another watershed will require both the sending and receiving Fish Health Inspectors to provide the relevant Co-managers and Co-operators with a brief written assessment of the risk posed by the transfer at least five (5) working days prior to the transfer (Appendix 8.5 of the SDCP). For the purposes of this policy a "new" detection is any reportable pathogen that has not been detected in a stock within the past three (3) successive spawning cycles.

Transfer requirements for broodstock used for nutrient enhancement purposes:

1. Transfer of carcasses within the original watershed;
2. Transfers for pasteurized fish products between watersheds.

There are four transfer requirements in the disease policy, but the two listed above are the only ones that apply to the Cowlitz drainage.

Requirements for transferring carcasses within their original watershed:

Adult carcasses can be transferred or planted within their original watershed provided the following conditions are met:

Fish Health Notification Requirement:

There is no fish health requirement to notify relevant Co-managers of transfers or plants of adult carcasses below anadromous fish barriers within the watershed they return to provided no regulated viral pathogens are detected in the stock.

Transfers or plants of carcasses above anadromous barriers within the watershed they return to requires prior approval of all relevant Co-managers. Co-managers and Co-operators must submit proposed transfer requests to relevant Co-managers for review and approval at least ten (10) working days prior to the transfer.

Testing requirement: Broodstock must be tested at a minimum of the low testing regime (95% APPL). This level requires 60 fish to be sampled in pools of from 1 to 5 fish.

Transfer options before the test results are completed: Transfers can proceed only to those areas within the watershed that are below anadromous fish barriers.

Transfer options after the test results are completed and found to be negative: Transfers can proceed anywhere within the watershed except to areas that are designated as a regulated pathogen free water source. In this case, all relevant Co-managers must approve the carcass plants before they can proceed.

Transfer restrictions if broodstock test positive for a regulated pathogen: All carcass transfers must be stopped if a regulated endemic pathogen is detected in the broodstock and not resumed until all relevant Co-managers reach consensus on a plan that provides adequate protection for both free ranging and cultured fish populations within the watershed. If the watershed is historically positive for a regulated pathogen, a plan can be agreed to before the spawning season occurs. In either case if carcass planting is resumed, transfers can proceed only to those areas within the watershed that are below anadromous fish barriers unless the area has already been identified as being positive for the regulated pathogen.

Requirements for transfers of pasteurized fish products within and between watersheds:

The use of pasteurized fish products (analogs) to enhance nutrients in a watershed provides an alternative to the use of untreated salmon carcasses that eliminates the fish health risks. This alternative should be considered wherever possible especially in sensitive areas such as above barriers. Analog products that have been determined to be free of regulated pathogens by the Co-managers' health staffs can be transferred to any watershed within Washington State.

Nutrient enhancement was implemented by WDFW in southwestern Washington approximately ten (10) years ago. There has been a significant increase in the number of IHNV outbreaks in WDFW operated steelhead facilities since this plan was begun. In this geographical region, steelhead/rainbow trout are the most susceptible species to IHNV and adult steelhead are positive for the virus more often than any other species. Steelhead should not be used for nutrient enhancement purposes, unless they are from a stock that has been sampled at the 98 % assumed pathogen prevalence level (APPL) or higher. This level would require 150 samples of ovarian fluid and kidney/spleen tissues in pools of from one (1) to five (5) fish. At the Cowlitz Trout hatchery, only 60 samples are collected, but the sampling is done on one or two days, so the 98 % APPL may apply on the specific sampling dates. However, the adults at Cowlitz Trout have historically been positive for IHNV. There is only a small chance that steelhead can safely be used for nutrient enhancement purposes. Coho are known to be the most refractive salmonid species reared in the region. They also have a lower prevalence of BKD and *C. shasta* than other Pacific salmon. Coho are by far the best species to use for nutrient enhancement purposes. Chinook have an intermediate risk for nutrient enhancement purposes. They infrequently test positive for IHNV, but have a higher incidence of BKD and *C. shasta* than coho.
Most Chinook and coho at the hatchery have been injected with antibiotics during captivity, and have not undergone the required 21 day withdrawal period, so they can't be used for nutrient enhancement.

Criteria to be used that allow the least risk for nutrient enhancement:

Freeze the carcasses to reduce IHNV levels. This also eliminates most parasites.

Do not use fish with obvious clinical signs of disease. (Hemorrhage, ascites, lesions in internal organs, white patches on internal organs.)

Do not use steelhead unless viral results have detected no virus in that stock or sampled group.

Do not use fish that have been injected with antibiotics within the required withdrawal period. (Avoids potential toxicity to wildlife.)

Do not use fish from other watersheds; do not export carcasses to other watersheds. If this is to occur, then the fish products are to be pasteurized before the transfer.

Section 3: The Salmonid Disease Control Policy in the Cowlitz River basin

The Co-managers Salmonid Disease Policy for the state of Washington describes the required sampling effort needed to insure that human activities are not spreading fish pathogens to new drainages. It also lists guidelines for containment of exotic pathogens and includes the required steps for notification of fish pathogen findings to other government agencies. A summary of requirements specific to this policy are as follows:

- Surveillance requirements for regulated pathogens
- Fish health monitoring requirements for cultured fish stocks
- Hatchery sanitation requirements
- Transfer requirements
- Site-specific containment plan requirement for pathogens of concern

Surveillance Requirement For Regulated Viral Pathogens:

Each broodstock population spawned at a Co-manager or Co-Operator facility will be tested annually for regulated viral pathogens at a minimum of the low testing regime (5% assumed pathogen prevalence (APPL)) as part of a statewide surveillance program. The required tissues and fluids for surveillance testing will be kidney, spleen, and ovarian fluid from sexually mature adults.

The 5% APPL refers to the sampling of 60 adults for viral testing from each run of a species on the Cowlitz. The samples must include both pools of ovarian fluid and pools of kidney and spleen. The pools can include no more than five fish, and are collected at the time of spawning. Testing procedures will comply with the guidelines in the American Fisheries Society Fish *Health Bluebook – Procedures For the Detection and Identification of Certain Fish Pathogens*. Transfers of fish and/or eggs out of the watershed do not happen by definition at Cowlitz River hatcheries. The drainage referred to in the policy includes the Lower Columbia River and its tributaries as one watershed. Fish are not transported out of the Cowlitz River watershed. Only eggs are allowed to be transferred out of the watershed under the under current WDFW guidelines.

Surveillance Requirement for Myxobolus cerebralis (M. cerebralis):

All water supplies containing fish will be tested for the presence of *M. cerebralis* at least once every three years if fish that are reared on that water supply are to be transferred to another watershed. This program will involve testing the most susceptible species on site (see Appendix) for the presence of *M. cerebralis* at a minimum of a 5% APPL every three years. The species selected for screening must have been exposed to the water supply a minimum of 1800

degree-days (Centigrade) or six (6) months before testing (USFWS and AFS Blue Book 2004 or current edition). For the Cowlitz River, fish are not transferred out of the Cowlitz watershed unless it is a special circumstance. However, it is important to monitor and sample for the presence of *M. cerebralis*. The Sampling of steelhead smolts at the Cowlitz Trout Hatchery will provide a strong monitoring effort for M. cerebralis. *Oncorhynchus mykiss* is the most susceptible species reared at Cowlitz River hatcheries but the steelhead generally are not exposed to untreated river water for the 1800 degree-days or six (6) months. Still, an annual test may be better suited for the Cowlitz system. Sixty fish will be tested annually prior to release. Fish reared in earthen ponds are the most likely to test positive for the parasite, so only fish from the acclimation lakes will be used in the monitoring effort. Adult sampling should also occur but it is not required by the Co-managers Disease Policy. Sixty adult Chinook and 60 adults steelhead will be sampled annually for *M. cerebralis*.

Fish Health Monitoring Requirements for Cultured Fish Stocks:

The health of each stock of fish reared at a Co-manager or Co-operator facility will be monitored on a monthly basis by a fish health inspector until the fish are released.

Any significant loss of fish will be promptly investigated by the facility manager and a fish health inspector. When fish disease agents are detected, preventative and therapeutic strategies will be implemented to reduce the impact of such disease agents on both free-ranging and cultured fish populations.

HATCHERY SANITATION REQUIREMENTS

Eggs:

All eggs taken into a culture facility must be water hardened in a minimum of 75 ppm buffered iodophor solution for one hour. However, if the appropriate Co-manager's or Co-operator's fish health staff demonstrates that this strategy is detrimental to egg survival for a specific stock, an acceptable alternative will be to disinfect the eggs with 100 ppm iodophor for a minimum of ten (10) minutes prior to being loaded into incubators. Currently, all steelhead and salmon eggs are water hardened in 100 ppm iodophor for one hour following fertilization, and eggs are disinfected for ten (10) to fifteen (15) minutes in 100 ppm iodophore when they are transferred.

All eyed eggs transferred to a new facility must be disinfected in a minimum of 100 ppm iodophor for a minimum of ten minutes upon receipt. All associated water and equipment must be disinfected as well before leaving the incubation area.

Equipment, Rearing Units, and Transport Vessels:

Equipment used to transfer eggs or fish between Fish Health Management Zones (FHMZ) including fish transfer vessels will be sanitized before being used for any other transport. In addition, it is recommended that all equipment and transport vessels be sanitized after gametes, eggs or fish are transferred to another watershed.

Rearing units should be cleaned regularly and the waste disposed of in a way to prevent its discharge into State waters.

Rearing units will be thoroughly cleaned in the following situations:

- ⇨ Before introducing a new fish stock into a rearing unit that had previously contained a fish stock that experienced a disease epizootic.
- ⇨ Before introducing a fish stock that will be reared in isolation on RPF water until their transfer or release.

Acceptable cleaning methods for rearing units with hard surfaces include, but are not limited to, pressure washing followed by using an approved disinfectant or by leaving it dry for a minimum of 24 hours. The acceptable minimum cleaning method for earthen ponds is to drain them and leave them dry for a minimum of 72 hours.

Mortality Removal:

Mortalities should be removed from rearing units on a regular basis wherever possible. Mortalities that are removed must be disposed of in a way that prevents their discharge into State waters. Acceptable methods include, but are not limited to, burial, composting, or rendering.

Information required for gamete or egg transfers:

1. A completed copy of the parental broodstock surveillance report; and,
2. A three (3) year history of regulated and reportable pathogens (see Appendix 9.1 of the SDCP for full reportable pathogen list) found within the facility and watershed.
3. Imports of eggs from outside the United States must also be accompanied by a “Title 50” Inspection Report (Code of Federal Regulations, 50 CFR 16.13) or an Injurious Wildlife Permit (Code of Federal Regulations, 50 CFR 16.22).

Information required for fish transfers:

All transfer requirements listed above for gametes or egg transfers and, a summary of all findings of reportable pathogens, epizootics, and diagnostic cases experienced by that lot; and, a risk assessment report if a reportable pathogen is detected in the lot to be transferred for the first time in three successive spawning cycles. The risk assessment report will be produced by the fish health inspectors from both the sending and receiving facilities and provided to the Co-Managers and Co-Operators in the receiving watershed at least five (5) working days prior to the transfer.

If fish have been reared on non Regulated Pathogen Free (RPF) water at any time during their rearing, the following additional items are also required prior to the transfer:

1. A completed fish health monitoring report performed by a fish health inspector no longer than four (4) weeks prior to transfer; and,
2. A copy of the completed virology test results done on either the lot to be transferred or a representative index group (RIG) within eight (8) weeks of transfer if the transfer is between watersheds.

Section 4: Future Brood Document Process

All Co-managers and Co-operators will incorporate their planned program of gamete, egg and fish transfers and releases for the coming year (August through July) into the Future Brood

Document process coordinated by Washington Department of Fish and Wildlife (WDFW) (Puget Sound Management Plan, 1985).

All proposed programs will be exchanged and reviewed by the Co-Managers' and Co-Operators' fish health staffs for consistency with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* each year. To aid in this review process, the Co-Managers' and Co-Operators' fish health staffs will produce and exchange a three (3) year history of regulated and reportable pathogens for all of their facilities by watershed by March 1. Upon final approval, the document will become accepted as the Current Brood Program and all transfers and releases listed within will be approved pending results of any fish health tests required within this policy.

In-Season Changes to the Current Brood Document for unlisted transfers or releases:

Any transfer or release of gametes, eggs, or fish which is not listed in the Current Brood Document requires the requesting Co-manager or Co-operator to notify all relevant Co-Managers a minimum of ten (10) working days prior to the proposed transfer or release. Changes can be made using WDFW's Brood Document Change Form or any other form that supplies similar information. If the transfer or release is consistent with this policy and there are no objections from relevant Co-Managers within ten (10) working days after notification, then the transfer or release is approved. No transfer or release that is inconsistent with this policy's requirements shall occur unless an exemption is acquired.

SITE-SPECIFIC CONTAINMENT PLANS FOR PATHOGENS OF CONCERN

All Co-manager and Co-operator operated facilities will be required to have a management plan on file that describes containment actions that will be taken in the event that a regulated exotic pathogen or a new pathogen that is causing significant biological loss is detected on site. Management plans will contain the following elements:

Process of notifying required Co-Managers and other regulatory authorities of the pathogen detection.

1. Establishment of a pathogen containment area including containment and/or disinfection procedures to prevent the movement of infected stock, equipment and contaminated materials out of the areas affected by the pathogen.
2. Containment of, or disinfection procedures for, the contaminated culture water from the affected stock.
3. Disposal procedures for dead eggs/fish.
4. Destruction of the infected stocks, if required.

Reporting Requirements:

As part of the Co-managers Disease Policy requirements, a three-year disease history will be updated by March 1 of each calendar year.

Viral pathogens endemic to the Cowlitz are to be reported within two (2) business days of finding(s).

"New" findings will be reported within five (5) business days (New meaning not found for 3 or more years at this site).

Outbreaks of an undetermined nature will require reporting within ten (10) business days to the co-managers.

Section 5: Amendment process for this plan

A procedure for modifying or amending this plan will be developed. The settlement agreement calls for a review of this plan after five (5) years. At that time, changes can be made. If it is found that there are unforeseen issues or changes in the SDCP, then the Fisheries Technical Committee (FTC) meeting will be presented with the recognition of the need for a change and possible changes to remedy on conflicts or problems found with the existing plan. This will be followed with an evaluation period for comments and suggestions of 60 days. If no comments or suggestions are made, then the changes will be put into effect. Proposed changes in this disease management plan will be distributed to fish health personnel that do not have access to the FTC web site.

Section 6: Consultation and comments

Date	Agencies/ Committees	Participants	Type of Communication	Topics
October 31, 2007	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, Yakama Nation, NMFS, WDOE, USFWS & AR/TU	Letter and attachment	• Distribution of preliminary draft outline
December 5, 2007	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, Yakama Nation, NMFS, WDOE, USFWS & AR/TU	Website posting	• Distribution and discussion of first draft of Disease Management Plan
January 9, 2008	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, NMFS, WDOE, USFWS & AR/TU	Cowlitz FTC meeting presentation	• Discussion of draft Fish Disease Management Plan
May 7, 2008	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, NMFS, WDOE,& AR/TU	Cowlitz FTC meeting discussion	• Announcement of final draft of Fish Disease Management Plan available for FTC review on Tacoma Power website
June 4, 2008	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, NMFS, WDOE,& AR/TU	Cowlitz FTC meeting discussion	• Announcement of final Fish Disease Management Plan available for FTC review on Tacoma Power website.
July, 2 2008	Cowlitz Fisheries Technical Committee (FTC)	Tacoma Power, WDFW, NMFS & AR/TU	Cowlitz FTC meeting discussion	• Reminder of final Fish Disease Management Plan available for FTC comment and review on Tacoma Power website

APPENDICES

Appendix A

List of pathogens and pathological conditions found on the Cowlitz River.

Non Infectious	*Ectoparasites*	*Endoparasites*	*Bacterial*	*Fungal*	*Viral*
Gas bubble Disease	**Ichthyoboda**	**C. shasta**	**Renibacterium salmoninarum**	**Saprolegnia parasitica**	**IHNV**
Drop Out syndrome	**Trichodina**	**Nanophyetus**	**Flavobacterium psyrchophilum**	**Phoma herbarum**	**EIBS**
Steatitis	**Ichthyopthirius**	**Henneguya**	**Aeromonas salmonicida**	**M. antarctica**	**Paramyxovirus**
Environmental Gill Disease	**Trichophrya**	**Hexamita**	**Yersinia ruckeri**		**Reovirus**
Coagulated Yolk syndrome			**A. hydrophila**		
	Epistylis	**Loma salmonae**	**F. branciophilum**		
	Ambiphrya		**Pseudomonas sp.**		
	Grydodactylus	**Rosette Agent**	**F. columnaris**		

Appendix B

"The Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State"

CONTENTS

Note: Individuals reading this policy should refer to the definition section in Appendix 8.1 for further clarifications of terms used in the policy.

1. POLICY STATEMENT AND GOALS

1.1. POLICY STATEMENT:

It shall be the policy of the Fisheries Co-Managers of Washington State to protect free-ranging and cultured fish populations from management activities that could cause the importation, dissemination, and amplification of pathogens known to adversely affect salmonids. These management activities include, but are not limited to, the transfer of gametes, eggs, fish, carcasses, or water between watersheds.

This policy sets forth the minimum fish health standards. A Co-Manager or Co-Operator may implement additional practices or measures at their facilities at their discretion. Further, acknowledging that many complex fish health situations will arise, it shall be the policy to foster open and frequent communication between Co-Managers and Co-Operators to jointly resolve these issues without endangering the health of free-ranging and cultured fish populations.

1.2. POLICY GOALS:

- To prevent the importation or establishment of regulated exotic pathogens into Washington State
- To prevent the introduction or establishment of regulated endemic pathogens to new watersheds within Washington State
- To reduce the biological impact of specific pathogens known to adversely impact salmonids
- To minimize the amplification of pathogens that can adversely affect both free-ranging and cultured fish populations
- To foster open and frequent communications between Co-Managers and Co-Operators on fish health issues

1.3. REGULATED PATHOGEN LIST:

Exotic Pathogens:

- *Oncorhynchus masou* virus (OMV*)*
- European strain of viral hemorrhagic septicemia virus (EU. VHSV)

Endemic Pathogens:

- Infectious hematopoetic necrosis virus (IHNV)
- Infectious pancreatic necrosis virus (IPNV)
- North American strain of viral hemorrhagic septicemia virus (N.A. VHSV)
- *Myxobolus cerebralis*

There are other serious fish pathogens not known to exist in Washington State that are not included in this list because there is not a statewide surveillance program in place for them (e.g. infectious salmon anemia virus). These pathogens may be added to this list in the future if new

information becomes available regarding their distribution and our surveillance program is expanded to include these pathogens.

2. MINIMUM FISH HEALTH STANDARDS

It shall be the intent of all signatories of this policy to implement the following minimum fish health standards in the categories listed below to accomplish the goal of preventing the importation, dissemination, and amplification of pathogens known to adversely affect salmonids.

- Surveillance requirements for regulated pathogens
- Fish health monitoring requirements for cultured fish stocks
- Hatchery sanitation requirements
- Transfer requirements for gametes and eggs, fish, carcasses, and water
- Site-specific containment plan requirement for pathogens of concern

2.1. SURVEILLANCE REQUIREMENT FOR REGULATED PATHOGENS:

2.1.1. Surveillance Requirement For Regulated Viral Pathogens:

- Each broodstock population spawned at a Co-Manager or Co-Operator facility will be tested annually for regulated viral pathogens at a minimum of the low testing regime (5% assumed pathogen prevalence level (APPL)) as part of a statewide surveillance program. The required testing regime may be increased depending on the management objectives for that stock as well as other considerations detailed in Section 2.4.3 (Gamete and Egg Transfer Requirements). The required tissues and fluids for surveillance testing will be kidney, spleen, and ovarian fluid from sexually mature adults
- In addition, each juvenile fish stock that has been reared on surface water or a Representative Index Group (RIG – see definitions in Appendix 8.1) will be tested for regulated viral pathogens at the 5% APPL within eight (8) weeks prior to their transfer to another watershed
- In both cases, testing must be conducted by, or under the supervision of, a Fish Health Inspector (see definitions in Appendix 8.1)

2.1.2. Surveillance Requirement For *Myxobolus cerebralis (M. cerebralis):*

- All water supplies containing fish will be tested for the presence of *M. cerebralis* at least once every three spawning cycles if fish that are reared on that water supply are to be transferred to another watershed. This program will involve testing the most susceptible species on site or a susceptible sentinel species (see Appendix 8.2.1) for the presence of *M. cerebralis* at a minimum of the 5% APPL every three years. The species selected for screening must have been exposed to the water supply a minimum of 1800 degree-days (Celsius) or six (6) months before testing (USFWS and AFS Blue Book 2004 or current edition)

2.2. FISH HEALTH MONITORING REQUIREMENTS FOR CULTURED FISH STOCKS:

- The health of each stock of fish reared at a Co-Manager or Co-Operator facility will be monitored on a regular basis (target monthly) by a Fish Health Inspector until the fish are released
- Any significant loss of fish that is suspected to be due to an infectious agent will be promptly investigated by the facility manager and a Fish Health Inspector. When an infectious agent is detected and implicated in the fish loss, preventative and therapeutic strategies will be implemented whenever possible to reduce the impact of such disease agents on both free-ranging and cultured fish populations

2.3. HATCHERY SANITATION REQUIREMENTS:

2.3.1. Eggs:

- All eggs taken into a culture facility must be water hardened in a minimum of 75 ppm buffered iodophor solution for one hour. However, if the appropriate Co-Manager's or Co-Operator's fish health staff demonstrates that this strategy is detrimental to egg survival for a specific stock, an acceptable alternative will be to disinfect the eggs with 100 ppm iodophor for a minimum of ten minutes immediately after water hardening (Amend and Pietsch 1972; Goldes and Mead 1995; Groberg 1990)
- All eyed eggs transferred to a new facility must be disinfected in a minimum of 100 ppm iodophor for a minimum of ten minutes upon receipt. All associated water and equipment must be disinfected before leaving the incubation area (Amend and Pietsch 1972; Goldes and Mead 1995; Groberg 1990)

2.3.2. Equipment, Rearing Units, and Transport Vessels:

- Equipment used to transfer gametes, eggs, or fish between Fish Health Management Zones (Appendix 8.3) including fish transfer vessels will be sanitized before being used for any other transport. In addition, it is recommended that all equipment and transport vessels be sanitized after gametes, eggs, or fish are transferred to another watershed
- Rearing units will be cleaned regularly whenever and wherever possible and the waste disposed of in a way to prevent its discharge into State waters
- Rearing units will be thoroughly cleaned in the following situations:

  - Before introducing a new fish lot into a rearing unit that had previously contained a fish lot that experienced a disease epidemic
  - Before introducing a fish lot that will be reared in isolation on regulated pathogen free water until their transfer or release

  Acceptable cleaning methods for rearing units with hard surfaces include, but are not limited to, pressure washing followed by either using an approved disinfectant or by leaving it dry for a minimum of 24 hours. The acceptable minimum cleaning method for earthen ponds is to drain them and leave them dry for a minimum of 72 hours.

2.3.3. Mortality Removal:

- Mortalities will be removed from rearing units on a regular basis whenever and wherever possible
- Mortalities that are removed must be disposed of in a way that prevents their discharge into State waters. Acceptable methods include, but are not limited to, burial, composting, or rendering

2.4. TRANSFER REQUIREMENTS:

The transfer of gametes, eggs, fish, carcasses for nutrient enhancement projects, and water in Washington State will be managed to prevent the importation of exotic pathogens into the State and the spread and amplification of regulated endemic fish pathogens within the State. All transfers will be required to meet the minimum requirements in the following three areas:

- Transfer notification and approval process (Section 2.4.1)
- Information exchange prior to transfer (Section 2.4.2)
- Specific transfer requirements for gametes and eggs (Section 2.4.3), fish (Section 2.4.4), carcasses (Section 2.4.5), and water (Section 2.4.6)

2.4.1. Transfer Notification Process:

Transfers of gametes, eggs, fish, or carcasses into, or within, Washington State are allowed under a permit system implemented by the Co-Managers. The permit system consists of a formal notification process of all proposed gamete, egg, live fish, or adult carcass transfers to all relevant Co-Managers and Co-Operators and documentation that they meet the fish health requirements specified in this Policy.

2.4.1.1. Future Brood Document Process:

All Co-Managers and Co-Operators will incorporate their planned program of gamete, egg, and fish transfers and releases for the coming year (August through July) into the Future Brood Document process coordinated by Washington Department of Fish and Wildlife (WDFW) (Puget Sound Management Plan, 1985).

All proposed programs will be exchanged and reviewed by the Co-Managers' and Co-Operators' fish health staffs for consistency with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* each year. To aid in this review process, the Co-Managers' and Co-Operators' fish health staffs will produce and exchange a three (3) year history of regulated and reportable pathogens for all of their facilities by watershed by March 1. Upon final approval, the document will become accepted as the Current Brood Program and all transfers and releases listed within will be approved pending results of any fish health tests required within this policy.

2.4.1.2. *In-Season Changes to the Current Brood Document for unlisted transfers or releases*:

Any transfer or release of gametes, eggs, or fish which is not listed in the Current Brood Document requires the requesting Co-Manager or Co-Operator to notify all relevant Co-Managers a minimum of ten (10) working days prior to the proposed transfer or release. Changes can be made using WDFW's Brood Document Change Form (Appendix 8.7.1), WDFW's Fish Transport Application/Permit (Appendix 8.7.2), or any other form that supplies similar information. If the transfer or release is consistent with this policy and there are no objections from relevant Co-Managers within ten (10) working days after notification, then the transfer or release is approved. No transfer or release that is inconsistent with this policy's requirements shall occur unless an exemption is acquired (Section 6.2).

2.4.2. Fish Health Information Required for Transfer

The following fish health information is required to be completed and on file with, or received by, the Co-Manager or Co-Operator of the receiving facility a minimum of five (5) working days prior to the actual transfer of gametes, eggs or fish:

2.4.2.1. *Information required for gamete or egg transfers:*

- A completed copy of the parental broodstock surveillance report; and,
- A three (3) year history of regulated and reportable pathogens (see Appendix 8.1 definition for a list of reportable pathogens) found within the facility and watershed
- Imports of gametes or eggs from outside the United States must also be accompanied by a "Title 50" Inspection Report (Code of Federal Regulations, 50 CFR 16.13) or an Injurious Wildlife Permit (Code of Federal Regulations, 50 CFR 16.22)

2.4.2.2. *Information required for fish transfers:*

- All transfer requirements listed above for gamete or egg transfers (2.4.2.1); and,
- A summary of all findings of reportable pathogens, epidemics, and diagnostic cases experienced by that lot; and,
- A risk assessment report if a reportable pathogen is detected in the lot to be transferred for the first time in three successive spawning cycles (see Section 2.4.4.1). The risk assessment report will be produced by the Fish Health Inspectors from both the sending and receiving facilities and provided to the Co-Managers and Co-Operators in the receiving watershed at least five (5) working days prior to the transfer (Appendix 8.5).
- If fish have been exposed to surface water at any time during their rearing, the following additional items are also required prior to the transfer (See Section 2.4.4.2.2):
- A completed fish health monitoring report performed by a Fish Health Inspector no longer than four (4) weeks prior to transfer; and,
- A copy of the completed virology test results performed on either the lot to be transferred or a representative index group (RIG) no longer than eight (8) weeks prior to transfer if the transfer is between watersheds.

2.4.2.3. *Responsibilities:*

- It shall be the responsibility of the receiving facility Co-Manager or Co-Operator to verify that (1) the transfer has been approved, and (2) all required fish health reports are completed and received prior to allowing entry of gametes, eggs, or fish onto their facility
- A gamete, egg, or fish transfer request may be denied on the basis of the pathogen history of the stock, facility, or watershed as determined by the receiving Co-Manager or Co-Operator

2.4.3. Gamete and Egg Transfer Requirements

This section specifies the minimum fish health requirements that must be met to transfer gametes or eggs into, or within, the Washington State. The requirements are intended to prevent gamete, or egg, associated transfer of regulated viral pathogens to new watersheds within the State.

2.4.3.1. Introduction:

The specific transfer requirements will vary depending on the relative risk that a specific lot of gametes or eggs pose of carrying a regulated viral pathogen to a new watershed. Gametes or eggs posing a higher level of risk will have more restrictive requirements to meet than those posing a lower risk. Factors that are considered in determining the relative risk level that a specific lot of gametes or eggs pose include:

- *Current pathogen status of the parental broodstock*: Gametes or eggs from parents that are infected with a regulated viral pathogen pose a higher risk of carrying that pathogen than do gametes or eggs from negative parents
- *Pathogen history of the sending watershed:* If regulated viral pathogens have been known to occur in the sending watershed and not in the receiving watershed, the risk of spreading the pathogen is higher
- *Water supply type***:** Eggs incubated on surface water pose a higher risk of being exposed to a regulated viral pathogen than do eggs incubated on regulated pathogen free water. This risk increases if the watershed has a positive history for regulated viral pathogens
- *Susceptibility of the species to be transferred to regulated viral pathogens:* Gametes or eggs from species that are highly susceptible to regulated viral pathogens pose a higher risk of carrying the virus than do those from species that are less susceptible (Appendix 8.2.2)

The minimum requirements for a specific gamete or egg transfer will vary depending on the risk level the transfer poses but in general will address the following areas:

- *Minimum adult testing requirements of the parental broodstock* (Low, Moderate, or High Testing Regimes explained in Appendix 8.4.1)
- *Water supply type* (Regulated pathogen free water vs. surface water) (see definitions in Appendix 8.1)
- *The transfer of gametes or eggs prior to the completion of the parental broodstock virus testing*

- *Length of time requirements apply after a virus is detected* (three spawning cycles for IHNV and IPNV and one spawning cycle for N.A. VHSV)

2.4.3.2. *General Egg Transfer Requirements:*

2.4.3.2.1. Minimum Egg Handling Requirements**:** The following requirements must be met for all gamete and egg transfers**:**

- All eggs that are to be transferred must be disinfected at the water hardening stage and again at transfer per the sanitation procedures described in Section 2.3.1.
- Gametes or eggs can be transferred to an approved quarantine facility (see definitions in Appendix 8.1) at any time regardless of the parental virus status provided that the necessary notifications have occurred with the relevant Co-Managers in the area

2.4.3.3. *Transfer requirements for gametes or eggs from the following five (5) broodstock types:*

- Free-ranging sockeye, kokanee and Columbia River broodstocks whose progeny are to be transferred to Puget Sound/WA coastal region (Section 2.4.3.3.1)
- Broodstocks and watersheds with a negative history of regulated viral pathogens (Section 2.4.3.3.2)
- Broodstocks with an incomplete history for regulated viral pathogens (Section 2.4.3.3)
- Broodstocks that can not be tested for regulated viruses (e.g. redd mined eggs) (Section 2.4.3.3.4)
- Broodstock or watersheds with a positive history for either IHNV or IPNV (Section 2.4.3.3.5)
- Broodstock or watersheds with a current detection of N.A. VHSV (Section 2.4.3.3.6)

2.4.3.3.1. Transfer requirements for gametes or eggs from all free-ranging sockeye, kokanee, and Columbia River broodstocks whose progeny are to be transferred to the Puget Sound or Washington Coastal Region:

The Co-Managers have identified the following transfer types as posing a high risk of transferring a regulated endemic viral pathogen to another watershed regardless of the pathogen history of either the specific broodstock or its natal watershed:

- The transfer of gametes and/or eggs from free-ranging sockeye and kokanee broodstocks' because of their high level of susceptibility to all of the regulated endemic viral pathogens especially IHNV (Amend 1977); and
- The transfer of Columbia River broodstocks whose progeny are to be transferred to the Puget Sound or Washington Coastal Region because of the high prevalence of IHNV in many Columbia River stocks and past detections of IPNV within the Columbia River Region

Gametes and/or eggs from these broodstock types can be transferred to another watershed provided all of the following minimum requirements are met:

- Broodstock are tested at the high testing regime; and,
- Eggs are incubated on regulated pathogen free water until transfer; and,
- Viral test results are completed before the transfer occurs. If gametes or eggs are transferred before the parental broodstock test results are completed, they must be held in quarantine at the receiving hatchery.

2.4.3.3.2. Transfer requirements for gametes or eggs from broodstocks and watersheds with a negative history of regulated viral pathogens:

Gametes or eggs that are from a broodstock and watershed that have an established negative history for regulated viral pathogens (see definition of "Negative History for Regulated Pathogens" in Appendix 8.1) can be transferred to any watershed within Washington State provided the requirements listed below are met:

Captive broodstocks reared on regulated pathogen free water:

- Broodstock are tested at a minimum of the low testing regime
- Gametes or eggs can be transferred to another watershed before the test results are done

All free-ranging broodstocks except (1) sockeye and kokanee and (2) all Columbia River region broodstocks whose progeny are transferred to the Puget Sound/Washington Coast region:

- Broodstock are tested at a minimum of the moderate testing regime
- Eggs can be incubated on surface water
- Gametes or eggs can be transferred to another watershed before the test results are done provided the following requirements are met: (1) they are transferred to another watershed within the same region (Columbia River vs. Puget Sound WA Coast), (2) the eggs are incubated in isolation at the receiving hatchery until eye up, and (3) if parental testing is not completed by the time the eggs eye up, then the eggs must be held in quarantine until the test results are completed. A detection of a regulated viral pathogen will require the gametes or eggs to be either returned to their original watershed or be destroyed

2.4.3.3.3. Transfer requirements for gametes or eggs from broodstocks with an incomplete history for regulated endemic viral pathogens:

Gametes or eggs that are from a broodstock that has not been tested for regulated viral pathogens for three successive years can be transferred to other watersheds within Washington State provided the requirements below are met.

- Broodstock is tested at the high testing regime for the first year if it does not have any prior testing history and at the moderate testing regime for the following two successive years until a negative history can be established; and,
- Eggs are incubated on regulated pathogen free water until transfer; and,
- Viral test results are completed before transfer. If gametes or eggs are transferred before the parental broodstock test results are completed, the resulting fertilized eggs must be held in quarantine at the receiving hatchery.

2.4.3.3.4. Transfer requirements for eggs that are from broodstocks that can not be tested for regulated viruses (e.g. redd mined eggs):

Such eggs can be transferred to other watersheds within Washington State provided the following requirements below are met:

- Eggs are disinfected upon arrival to the receiving hatchery unless the attending Fish Health Inspector determines that it would be harmful to the developing embryos; and,
- Eggs are held in isolation if they stay within their original watershed or in quarantine if they are transferred to another watershed; and,
- The resulting fry are tested for regulated viral pathogens at the 2% APPL.

If the test results for regulated viral pathogens are negative and the fry remain within the Fish Health Management Zone (See Appendix 8.3) they were collected in, they may be removed from isolation/quarantine. However, if they are transferred to a different Fish Health Management Zone, they must stay in quarantine the entire time.

If the test results are positive for a regulated viral pathogen, the fry must be destroyed or returned to their original watershed.

2.4.3.3.5. Transfer requirements for gametes or eggs from all broodstocks within watersheds that have either a current detection, or a positive history of either IHNV or IPNV:

Gametes and eggs can be transferred from broodstocks or watersheds that have a current detection or a positive history of either IHNV or IPNV to any watershed within Washington State provided the requirements listed below are met:

Minimum transfer requirements during the current spawning cycle (Year 0) in which IHNV or IPNV is detected:

Gametes or eggs from any parents that test positive for IHNV or IPNV or gametes or eggs from untested parents from a positive broodstock can not be transferred outside of their original watershed unless they go to an approved quarantine facility.

Gametes or eggs from negative parents of the positive broodstock and from all other broodstocks that have been exposed to surface water in the watershed can be transferred to another watershed provided all of the following conditions are met:

- The parents are tested at the high testing regime and the results are negative (*Broodstock culling is allowed within a single days egg take if protocols have been pre-approved by the relevant Co-Managers); and,*
- Eggs are incubated on regulated pathogen free water until transfer; and,
- Viral test results are completed before transfer occurs. If gametes or eggs are transferred before the parental broodstock test results are completed, they must be held in quarantine at the receiving hatchery.

Gametes and eggs from captive broodstocks (see definitions) can be transferred to another watershed provided all of the following requirements are met:

- Captive broodstock located at the positive facility:
    - Broodstock are tested at a minimum of the moderate testing regime; and,
    - Eggs are incubated on regulated pathogen free water until transfer; and,
    - Viral tests are completed before transfer. If gametes or eggs are transferred before the parental broodstock testing is completed, they must be held in quarantine at the receiving hatchery.
- Captive broodstock located at a different facility within the positive watershed:
    - Broodstock are tested at a minimum of the low testing regime; and,
    - Eggs are incubated on regulated pathogen free water until transfer.
    - Gametes or eggs can be transferred to another watershed before the test results are completed.

Minimum transfer requirements during the first spawning cycle (Year 1) following a positive detection:

- Minimum required adult testing regimes:
    - The specific broodstock that tested positive for IHNV or IPNV in the previous spawn cycle (Year 0) is tested at the high testing regime;
    - Captive broodstocks are tested at a minimum of the low testing regime;
    - All other broodstocks are tested at a minimum of the moderate testing regime;
    - All test results are negative; and,
- Eggs are incubated on regulated pathogen free water if they are to be transferred to a negative watershed. Eggs can be incubated on surface water if they are to be transferred to a watershed that has a positive history for the pathogen detected
- Transfers prior to completion of test results:
    - Captive broodstock: Gametes or eggs can be transferred before the test results are completed
    - All other broodstocks: Viral test results must be completed before transfer. If gametes or eggs are transferred before the parental broodstock test results are completed, they must be held in quarantine at the receiving hatchery

Minimum transfer requirements during the second and third spawning cycles (Years 2 & 3) following a positive detection:

- Minimum adult testing regime requirements:
    - All free-ranging broodstock are tested at a minimum of the moderate testing regime (including the broodstock that tested positive in Year 0), and,
    - All captive broodstock are tested at a minimum of the low testing regime.

- No change in requirements from Year 1 for incubation water type or in transferring the gametes or eggs prior to completion of the test results

2.4.3.3.6. Transfer requirements for gametes or eggs from all broodstocks within watersheds in which N.A. VHSV has been detected in the current spawning cycle:

Minimum transfer requirements during the current spawning cycle in which N.A. VHSV is detected:

- Gametes or eggs from parents that test positive for N.A. VHSV or from untested parents from a positive broodstock can not be transferred outside their original watershed unless they go to an approved quarantine facility

  Gametes or eggs from negative parents of a positive broodstock can still be transferred to another watershed if the following requirements are met:

- Parents of the gametes or eggs to be transferred are tested at the high testing regime *(Broodstock culling is allowed within a single days egg take if protocols have been pre-approved by the relevant Co-Managers); and,*
- Eggs are incubated on regulated pathogen free water until transfer; and,
- Viral test results are completed before transfer. If gametes or eggs are transferred before the parental broodstock test results are completed, the resulting fertilized eggs must be held in quarantine at the receiving hatchery.

  Gametes or eggs from other broodstocks within the positive watershed can still be transferred to another watershed provided the following requirements are met:

- Minimum required adult testing regime:
  - Captive broodstocks are tested at a minimum of the low testing regime, and,
  - Free-ranging broodstocks are tested at a minimum of the moderate testing regime; and,
- Eggs are incubated on regulated pathogen free water until transfer, and,
- Transfers prior to completion of test results:
  - Captive broodstock: Gametes or eggs can be transferred before the test results are completed
  - All other broodstocks: Viral test results must be completed before transfer. If gametes or eggs are transferred before the parental broodstock test results are completed, the resulting fertilized eggs must be held in quarantine at the receiving hatchery

Additional fish testing requirements during the spawning cycle in which N.A. VHSV is detected in an adult**:**

- Immediate testing of all juvenile stocks that are on surface water at the positive facility at the 2% APPL
- Subsequent testing of progeny from the positive broodstock at swim-up at the 2% APPL

Transfer requirements in future spawning cycles:

If progeny from the positive broodstock and all juvenile stocks on surface water at the site at the time of the detection are tested at the 2% APPL and found to be negative for N.A. VHSV, then the increased transfer restrictions will end after that spawning cycle (see definitions).

A detection of N.A. VHSV in juvenile fish will require an immediate halt to transfers out of the affected watershed of gametes, eggs and fish that have been exposed to surface water, extension of the above restrictions for three additional years, and the convening of an emergency meeting of the Co-Managers and Co-Operators to determine further actions.

2.4.4. Fish Transfer Requirements

Co-Managers and Co-Operators will manage the fish health risks posed by fish transfers by restricting their transfers between both watersheds and Fish Health Management Zones (FHMZs). A FHMZ is a geographic area containing one or more adjacent watersheds within which the transfer of live fish that have been reared on surface water is controlled for fish health management purposes. See Appendix 8.3 for a complete list of watersheds and FHMZs in Washington.

The restrictions are less if fish are transferred to a watershed within their FHMZ than if they are transferred to a watershed outside of their FHMZ. Restrictions are based on the following factors:

- The regulated pathogen status of the stock and the originating watershed (positive vs. negative)
- The regulated pathogen that is detected (IHNV, IPNV, N.A. VHSV, or *M. cerebralis*)
- The water supply type (regulated pathogen free water vs. surface water)
- The susceptibility of the species to be transferred to regulated pathogens (Appendix 8.2)

2.4.4.1. *Minimum requirements that apply to all fish transfers:*

- The Fish Health Inspector from the sending facility must provide the receiving Co-Managers and Co-Operators and their Fish Health Inspectors a summary of all findings of reportable and regulated fish pathogens, epidemics, and diagnostic cases experienced by this lot at least five (5) working days prior to the transfer
- A new detection of a reportable pathogen in a stock to be transferred to another watershed will require both the sending and receiving Fish Health Inspectors to provide the relevant Co-Managers and Co-Operators with a brief written assessment of the risk posed by the transfer at least five (5) working days prior to the transfer (Appendix 8.5).

For the purposes of this policy, a "new" detection is any reportable pathogen that has not been detected in a stock within the past three successive spawning cycles

- Fish lots that meet any of the following criteria will not be allowed to be transferred between watersheds: (1) Fish lots that are experiencing an epidemic at the time of the proposed transfer, (2) Fish lots that have had a positive detection of a regulated pathogen, and (3) Fish lots that have been reared on surface water in one of the listed IHN endemic watersheds (Columbia River below Chief Joseph Dam, Skagit River, Quinault River, Lake Washington Basin, and Lake Ozette Basin)
- Fish can be transferred to an approved quarantine facility (see definitions in Appendix 8.1) at any time regardless of their pathogen status provided the necessary notifications have occurred with the relevant Co-Managers or Co-Operators. Fish that are held in quarantine can be returned to their original watersheds if they are not exposed to any new regulated or reportable pathogens

2.4.4.2. *Transfer Requirements For The Following Four Transfer Types:*

- Transfers of fish that have been reared full term on regulated pathogen free water and in isolation (Section 2.4.4.2.1)
- Transfers of fish reared on surface water within the same FHMZ (Section 2.4.4.2.2)
- Transfers of fish between FHMZs (Section 2.4.4.2.3)
- Transfers of fish from fresh to saltwater (Section 2.4.4.2.4)
- Transfers of fish from salt to freshwater (Section 2.4.4.2.5)

2.4.4.2.1. Transfers of fish that have been reared their entire life in isolation on regulated pathogen free water:

Fish reared their entire life in isolation on regulated pathogen free water can be transferred to any waters (either fresh or saltwater) within Washington State provided the following conditions are met:

- All of the Gamete and Egg Transfer Requirements have been met in Section 2.4.3; and,
- All of the testing requirements for regulated pathogen free water have been met (see regulated pathogen free water definition in Appendix 8.1); and,
- There has not been a detection of a regulated pathogen in the fish lot.

2.4.4.2.2. Transfers of fish that have been reared on surface water within the same FHMZ:

Fish transfers within a watershed:

Fish transfers within a watershed will not be restricted by this policy. They will be done at the discretion of the relevant Co-Managers and Co-Operators in that watershed.

Transfers of fish from a watershed with an established negative history for regulated pathogens (see definitions in Appendix 8.1):

Fish from a watershed with an established negative history for regulated pathogens can be transferred to any watershed within the same FHMZ provided the following conditions are met**:**

- Either the lot to be transferred or a representative index group (RIG) on site is screened and found negative for regulated viral pathogens at the 5% APPL no longer than eight (8) weeks prior to transfer; and,
- The water supply the lot is reared on is tested for the presence of *M. cerebralis* at least once every three years as per the requirement listed in 2.1.2; and,
- A fish health exam is conducted on the lot to be transferred by a fish health inspector within four (4) weeks of the transfer.

Transfers of fish from a watershed with a positive history for regulated pathogens:

Fish from a watershed with a positive history for regulated pathogens can not be transferred to another watershed within the FHMZ for the following time periods:

- Three (3) successive spawning cycles following the detection of IHNV, IPNV, and *M. cerebralis*; and,
- The current spawning cycle for detections of N. A. VHSV if it is in adult broodstock or three (3) successive spawning cycles following its detection in juvenile fish.

2.4.4.2.3. Transfers of fish between FHMZs:

- The only fish that will be allowed to be transferred between FHMZs are fish that have been reared full term on regulated pathogen free water and held in isolation. Transfers can proceed without any additional requirements provided they met the transfer requirements as eggs and they have not had any detections of regulated pathogens
- Fish reared on surface water can not be transferred to a watershed in a different FHMZ

2.4.4.2.4. Transfers of fish from fresh to saltwater**:**

- Fish reared on surface water in a watershed with a negative history of regulated pathogens can be transferred to saltwater rearing containers without any additional testing requirements
- Fish reared on surface water in a watershed with a positive history for regulated pathogens (including progeny from positive broodstock) can be transferred to saltwater rearing containers/net pens or released directly into saltwater provided they are tested at the 5% APPL no longer than eight (8) weeks prior to the transfer and found negative for the pathogen

2.4.4.2.5. Transfers of fish from salt to freshwater:

- Captive broodstock that have not had detections of regulated pathogens can be transferred from saltwater back to their watershed of origin

2.4.5. Carcass Transfer Requirements

The deliberate distribution of adult salmonid carcasses into watersheds for the purpose of nutrient enhancement can pose fish health risks if not properly managed. Disease organisms present in salmon carcasses can be transmitted to other salmonids following the release of these organisms into water or through their direct consumption. The Co-Managers will manage the fish health risk posed by carcass transfers by restricting their transfers within and between watersheds. Factors that will be taken into consideration in determining the restrictions include:

- The pathogen status of the broodstock and the watershed (current and historical)
- The regulated pathogen of concern (IHNV, IPNV, N.A. VHSV, or *M. cerebralis*)
- The susceptibility of the species to be transferred to a regulated pathogen (Appendix 8.2)

2.4.5.1. *Minimum requirements for broodstock used for nutrient enhancement purposes:*

- The broodstock must have survived to spawn or have been killed as excess broodstock; and,
- The broodstock must have met the required withdrawal time (e.g. as required by the FDA or prescribing veterinarian) if it received any antibiotic injections.
- All pre-spawning mortalities (including their eggs) and adults that have not met the required withdrawal time (e.g. as required by the FDA or prescribing veterinarian) can not be used for nutrient enhancement purposes and must be disposed of in a way that prevents pathogens from getting back into State waters. Acceptable disposal methods include, but are not limited to, burial, composting, or rendering
- A new detection of a reportable pathogen in a broodstock to be transferred to another watershed will require both the sending and receiving Fish Health Inspectors to provide the relevant Co-Managers and Co-Operators with a brief written assessment of the risk posed by the transfer at least five (5) working days prior to the transfer

(Appendix 8.5). For the purposes of this policy, a “new” detection is any reportable pathogen that has not been detected in a stock within the past three successive spawning cycles.

2.4.5.2. *Transfer requirements for the following four transfer types:*

- Transfers of carcasses within their original watershed (Section 2.4.5.2.1)
- Transfers of carcasses between watersheds within the same FHMZ (Section 2.4.5.2.2)
- Transfers of carcasses between FHMZs (Section 2.4.5.2.3)
- Transfers of pasteurized fish products (analogs) between watersheds (Section 2.4.5.2.4)

2.4.5.2.1. Requirements for transferring carcasses within their original watershed

Adult carcasses can be transferred or planted within their original watershed provided the following conditions are met:

- *Fish Health Notification Requirement*:
    - There is no fish health requirement to notify relevant Co-Managers of transfers or plants of adults carcasses below anadromous fish barriers within the watershed they return to provided no regulated viral pathogens are detected in that stock
    - Transfers or plants of carcasses above anadromous barriers within the watershed they return to does require prior approval of all relevant co-managers. Co-Managers and Co-Operators must submit proposed transfer requests to relevant Co-Managers for review and approval at least ten (10) working days prior to the transfer
- *Testing requirement*: Broodstock must be tested at a minimum of the low testing regime
- *Transfer options before the test results are completed*: Transfers can proceed only to those areas within the watershed that are below anadromous fish barriers
- *Transfer options after the test results are completed and found to be negative:* Transfers can proceed anywhere within the watershed except to areas that are designated as a regulated pathogen free water source. In this case, all relevant Co-Managers must approve the carcass plants before they can proceed
- *Transfer restrictions if broodstock test positive for a regulated pathogen*: All carcass transfers must be stopped if a regulated endemic pathogen is detected in the broodstock and not resumed until all relevant Co-Managers reach consensus on a plan that provides adequate protection for both free-ranging and cultured fish populations within the watershed. If the watershed is historically positive for a regulated pathogen, a plan can be agreed to before the spawning season occurs. In either case, if carcass planting is resumed, transfers can proceed only to those areas within the watershed that are below anadromous fish barriers unless the area has already been identified as being positive for the regulated pathogen

2.4.5.2.2. Requirements for transfers of carcasses between watersheds within the same FHMZ

Adult carcasses can be transferred between two watersheds within the same FHMZ provided the watershed of origin has an established negative history for regulated pathogens (see definitions in Appendix 8.1). Specific conditions that must be met are as follows:

- *Notification Requirement*: All proposed transfers of adult carcasses between watersheds must go through a Co-Manager review and approval process. Anyone wishing to transfers carcasses must submit their proposed transfer requests to relevant Co-Managers for review and approval at least ten (10) working days prior to the transfer.
- *Testing Requirements*: Free-ranging broodstock must be tested at a minimum of the moderate testing regime for regulated viral pathogens. Testing for *M. cerebralis* must have occurred as per the requirements listed in Section 2.1.2.
- *Transfer Restrictions*: Transfers can not proceed until the test results are completed and are negative.
- *Carcass Treatment*: All carcasses must be treated in a way to reduce the overall pathogen load prior to their transfer. Acceptable methods include freezing at –20° F,

heating to 86° F for three (3) hours, or eviscerating which includes removing the kidneys and beheading the carcasses (Guttenberger et. al. 2001).

2.4.5.2.3. Requirements for transfers of carcasses between FHMZs:

The transfer of carcasses between watersheds in different FHMZs is not allowed due to the high fish health risk.

2.4.5.2.4. Requirements for transfers of pasteurized fish products within and between watersheds:

The use of pasteurized fish products (analogs) to enhance nutrients in a watershed provides an alternative to the use of untreated salmon carcasses that eliminates the fish health risks. This alternative should be considered wherever possible especially in sensitive areas such as above anadromous barriers. Analogs products that have been determined to be pathogen free by the Co-Managers' fish health staffs can be transferred to any watershed within Washington State.

2.4.6. Water Transfer Requirements

The transfer of surface water from one watershed to another can result in the introduction of fish pathogens into the receiving watershed. Factors that affect the level of risk include (1) the pathogen history of the sending watershed, (2) the susceptibility of the species in the receiving watershed to the pathogens, and (3) the volume of water being transferred.

Due to the fish health risks associated with the transfer of untreated surface water between watersheds, the Co-Managers strongly recommend the use of regulated pathogen free water if a water transfer has to occur between watersheds. There are no restrictions for the transfer of regulated pathogen free water between watersheds. However, if this is not possible, the following minimum requirements must be met for the transfer of surface water between watersheds:

- The sending watershed must have an established negative history for all regulated pathogens; and,
- The transfer can only be to another watershed within the same FHMZ (Appendix 8.3).

2.5. SITE-SPECIFIC CONTAINMENT PLANS FOR PATHOGENS OF CONCERN

All Co-Manager and Co-Operator operated facilities will be required to have a management plan on file that describes containment actions that will be taken in the event that a regulated exotic pathogen or a previously undescribed that is causing significant biological loss is detected on site. Management plans will be reviewed every five (5) years and should contain the following elements:

- Process of notifying required Co-Managers and other regulatory authorities of the pathogen detection
- Establishment of a pathogen containment area including containment and/or disinfection procedures to prevent the movement of infected stock, equipment and contaminated materials out of the areas affected by the pathogen

- Containment of, or disinfection procedures for, the contaminated culture water from the affected stock
- Disposal procedures for dead eggs/fish
- Destruction of the infected stocks, if required

3. COMMUNICATIONS AND REPORTING REQUIREMENTS

3.1. Presumed or confirmed identification of a regulated exotic pathogen or any new fish pathogen that is causing significant biological loss in Washington State requires implementation of the Site Specific Pathogen Containment Plans (Section 2.5) and the immediate notification of the Co-Managers' and Co-Operators' fish health staffs. This notification will be followed by an emergency meeting of the Co-Managers to discuss further management actions required to contain the pathogen.

3.2. Presumed and confirmed identifications of a regulated endemic pathogen within any stock and/or site will require notification of Co-Managers' and Co-Operators' fish health staffs, in writing, within two (2) working days to allow for increased sampling or other control measures at facilities within the affected area.

3.3. "New" identifications of any reportable pathogen will require written notification of the Co-Managers' and Co-Operators' fish health staffs within five (5) working days. This notification should highlight all planned transfers of this stock. A "new" identification is any reportable pathogen that has not been detected in a stock within the past three (3) successive spawning cycles.

3.4. Epidemics that are due to undetermined cause(s) will require written notification to all of the relevant Co-Managers' and Co-Operators' fish health staffs within ten (10) working days after the attending Fish Health Inspector is notified of the loss.

3.5. Annual meetings will occur between the Co-Managers' and Co-Operators' fish health staffs to ensure good communications. The meetings will be hosted by WDFW on the odd years and NWIFC on the even years.

3.6. The Co-Managers' and Co-Operators' fish health staff must provide each other with a three (3) year history of regulated and reportable pathogens at each of their facilities by March 1of each year.

4. TECHNICAL PROCEDURES

4.1. The minimum procedures for inspection will be those described in the current edition of the AFS FHS Blue Book (AFS-FHS 2004 or current edition) or USFWS Title 50 (Code of Federal Regulations, 50 CFR 16.13).

4.2. Co-Managers or Co-Operators may utilize other procedures by mutual agreement when appropriate.

5. MONITORING AND EVALUATION

It is the intent of the Co-Managers to annually evaluate the effectiveness of this policy in achieving the policy goals listed in Section 1.2. The Co-Managers' fish health staffs will

facilitate this process by producing an annual report to the signatories of this Salmonid Disease Control Policy at the start of each spawning cycle (July 1) that will contain the following information:

- The number of juvenile and adult stocks that were tested for regulated pathogens in the previous spawning cycle
- The number of stocks that tested positive for a regulated pathogen by pathogen type, location, the species and stage of the host that the detection occurred in, and whether it was associated with disease
- The number of regulated pathogen detections that occurred in watersheds or fish stocks that previously had a negative history for regulated pathogens
- The suspected sources of the infections
- Whether the positive species were transferred as eggs or fish

6. AMENDMENT AND EXEMPTION PROCESS

6.1. AMENDMENT PROCESS

The Co-Managers acknowledge that changes will need to be made to this document periodically to reflect new developments in fish health. To address this need, they have agreed to the following process for any future amendments:

> All proposed changes will be initially developed and agreed to by Co-Managers' fish health representatives. The draft changes will then be distributed in writing to all signatory Co-Managers for a minimum of a thirty (30) day review period. All agreed upon changes will be incorporated into a final version and re-distributed to Co-Managers for their approval and signature. Any amendments to the policy will not be final until all of the participating Co-Managers have signed off on the changes and received a final copy of the Salmonid Disease Control Policy.

6.2. EXEMPTION PROCESS

Any Co-Manager or Co-Operator requesting an exemption to the Salmonid Disease Control Policy must notify all signatory parties in writing of their intentions and an explanation at least ten (10) working days prior to the action. An exemption is granted if there has not been any written fish health objections submitted by any of the signatory Co-Managers. If there is an objection that cannot be resolved, the procedure for dispute resolution established for the area, i.e. Puget Sound Management Plan or the Columbia River Management Plan will be followed.

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8. APPENDIX

8.1. DISEASE POLICY DEFINITIONS:

ASSUMED PATHOGEN PREVALENCE LEVEL (APPL) – The percent of any lot of fish, either 2% or 5%, that is assumed to have a pathogen at a detectable level using tests outlined in the AFS "Fish Health Blue Book" or a test agreed to by the Co-Managers' fish health staffs. This level is used to determine the sample size needed to provide a 95% confidence level of including an infected fish in the sample.

BROODSTOCK:

- Captive Broodstock – All adult salmonids which have been reared their entire life in captivity and on regulated pathogen free water for the purpose of collecting gametes. This includes stocks which are landlocked for their entire life cycle as long as their water supply meets the definition of regulated pathogen free. For the purpose of this policy, all captive broodstock that are reared on surface water will be considered to be "Free Ranging Broodstock"
- Free-Ranging Broodstock – All adult salmonids collected or captured from the waters of Washington State, for the purpose of collecting gametes, which have spent at least part of their life cycle free-ranging, either in salt or fresh water. Adult fish collected or captured temporarily but released unspent are not considered broodstock

CARCASSES – Dead adult salmonids that either survived to spawn or were killed as excess broodstock.

CO-OPERATORS – All government agencies and entities other than the Co-Managers involved in the rearing and transfer of salmonids in Washington State.

CO-MANAGERS – Federally recognized Treaty Indian Tribes within Washington State and the State of Washington, Department of Fish and Wildlife (WDFW).

CONFIRMED VIRAL IDENTIFICATION – The identification of a replicating viral agent by serum neutralization assay or other confirmatory test agreed to by the Co-Managers.

CURRENT BROOD DOCUMENT – The final version of the Future Brood Document that has been reviewed and approved by all Co-Managers and Co-Operators (see Section 2.4.1.1). All egg/fish transfers listed in this document will be approved pending results of their fish health inspection.

EGG – Fertilized eggs of salmonids.

EGG DISINFECTION – The exposure of water-hardened or eyed eggs to a buffered iodophor solution containing at least 100 ppm active iodine for not less than ten (10) minutes. The minimum ratio of iodophor solution to fertilized eggs (volume to volume) will be one (1) part iodophor solution to one (1) part eggs with no reuse of solution.

EPIDEMIC – The occurrence of an infectious disease which results in an average daily mortality of at least 0.1% within a specific rearing unit for five (5) consecutive days.

FISH (LIVE) – Live salmonids from the alevin to the adult stage.

FISH HEALTH BLUE BOOK – The most recent edition of the AFS FHS blue book: suggested procedures for the detection and identification of certain finfish and shellfish pathogens (AFS-FHS 2004 or current edition).

FISH HEALTH INSPECTOR – An individual who either holds or meets the requirements of one of the following certifications:

- American Fisheries Society (AFS) – Fish Health Inspector or Fish Pathologist
- Canadian Fish Health Officer
- United States Title 50 Inspector (Code of Federal Regulations, Title 50, Chapter 1, Subchapter B, Part 16)

FISH HEALTH MANAGEMENT ZONE (FHMZ) – A geographic area containing one or more watersheds within which the transfer of live fish is permitted when specific fish health requirements are met. Facilities that have regulated pathogen-free water supplies can be islands within an FHMZ and have less restrictions on fish transfers out of watershed than their surface water counterparts. Fish Health Management Zones are listed in Appendix 8.3.

FREE-RANGING – Fish which are free to migrate in a natural environment.

FUTURE BROOD DOCUMENT (FBD) – A draft document consisting of all Co-Managers' and Co-Operators' programs of proposed egg and fish transfers and releases for the coming year. This document is coordinated by Washington Department of Fish and Wildlife

GAMETES – Unfertilized eggs and sperm of salmonids.

INSPECTION – The collection of a statistically valid sample of fish tissues and/or fluids for examination for regulated pathogens. This is to be performed by, or under the supervision of, a Fish Health Inspector. Methods used will be those described in the "Fish Health Blue Book" or others mutually agreed to by Co-Managers' fish health staff.

IODOPHOR WATER-HARDENING EGGS – The exposure of recently fertilized eggs (not more than five [5] minutes post exposure to water) to a buffered iodophor solution containing at least 75 ppm iodine for not less than sixty (60) minutes. The minimum ratio of iodophor solution to eggs (volume to volume) will be one (1) part iodophor solution to one (1) part eggs with no reuse of solution.

ISOLATION – The process of keeping a group of eggs or fish physically separated from other groups at the same facility for the purpose of preventing cross contamination with possible pathogens. This is accomplished by incubating/rearing in separate containers with no reuse of each others' incubation/rearing water. A group may consist of an entire lot of fish or be a smaller unit of one lot, such as one day's spawn. Separate equipment for each group is preferable, but reuse of equipment is acceptable if it is adequately disinfected between isolation units.

LANDLOCKED – Fish in a system that has a barrier preventing passage of all anadromous fish or other fish which have come into contact with anadromous fish.

LOT OF FISH – A group of fish of the same species and age that originated from the same discrete spawning population and that have always shared a common water supply. In the case

of adult broodstock, various age groups may comprise the same "lot" provided they are of the same species and have shared the same water supply while brood fish.

NEGATIVE HISTORY FOR REGULATED ENDEMIC PATHOGENS:

- BROODSTOCK: A negative history is established for a specific broodstock if it has been tested for regulated endemic viral pathogens at a minimum of the low testing regime in the past three consecutive spawning cycles and found negative for IHNV and IPNV and tested and found negative for N.A. VHSV in the current spawning cycle
- WATERSHED: A negative history for a watershed is established if the following regulated pathogens have not been detected in any free-ranging or cultured stocks: IHNV, IPNV, or *M. cerebralis* in the past three consecutive spawning cycles, and N. A. VHSV within the current spawning cycle. A detection of N.A. VHSV or *M. cerebralis* in juvenile fish will extend this time frame to three consecutive spawning cycles. To establish a negative watershed history, all broodstocks that are spawned at all Co-Manager or Co-Operator facilities must be screened for regulated endemic viral pathogens at a minimum of the low testing regime during this time. If a facility does not hold any broodstock, this requirement will be established by testing the most susceptible species on site for regulated endemic viral pathogens at the 5% APPL annually (see Appendix 8.2). In addition, M. cerebralis must be screened for every three spawning cycles as per the surveillance requirements in Section 2.1.2.

PRESUMPTIVE VIRAL IDENTIFICATION – The detection of a replicating agent in cell cultures inoculated with fish tissues or fluids. Presumptive identification is made when cytopathic effect (CPE) is replicated in cell culture.

QUARANTINE – Keeping a group of eggs or fish in isolation as defined above with the following restriction: effluent from eggs or fish in quarantine will be disinfected with a residual level of at least 2 ppm chlorine for a minimum of ten (10) minutes of contact time or by other methods acceptable to relevant Co-Managers.

QUARANTINE FACILITY – A facility which holds eggs or fish in quarantine for a specific amount of time. All quarantine facilities must be reviewed and approved by WDFW in writing prior to operation. Prior to approving any new facility, WDFW will provide the relevant Co-Managers' fish health staffs five (5) working days to review and comment on the proposed plans.

REGULATED PATHOGEN-FREE WATER – Water which is free of regulated fish pathogen(s). This includes the following:

1. Ground water or untreated surface water which has been demonstrated to be fish-free; or,
2. Surface water containing fish which has been treated in a manner sufficient to destroy all of the regulated pathogens; or,
3. Untreated surface water containing fish, but only if the following criteria are met:

- All fish present in the surface water are landlocked; and,
- A three (3) year negative history for all regulated pathogens has been established for that water supply. To establish a negative history for regulated viral pathogens, all of the susceptible captive broodstock on site that are being reared on the water supply must be

tested annually for these viral pathogens at the moderate testing regime (Appendix 9.4) and found negative for three successive spawning cycles. If no susceptible broodstocks are present, then the most susceptible juvenile stock (free-ranging or cultured) that has been reared on this water can be substituted (Appendix 8.2). To establish a negative history for the regulated parasite pathogen, *M. cerebralis*, the most susceptible species on site or within the watershed that has received adequate exposure to show the infection must be tested annually at the 5% APPL for three consecutive spawning cycles and be negative. Adequate exposure means the fish have been exposed to the surface water supply a minimum of 1800 degree days (Celsius) or six months before testing; and

- After a three year negative history has been established, subsequent testing for regulated viral pathogens must occur annually at a minimum of the low testing regime and for *M. cerebralis* testing must be at least every three spawning cycles at the 5 % APPL; and
- All stocks planted into this water supply must have been reared full term on regulated pathogen free water and have an established negative history for regulated pathogens per this Salmonid Disease Control Policy's requirements.

REGULATED PATHOGENS – Fish pathogens that are regulated within Washington and meet all of the following criteria: (1) have the potential to cause significant economic and/or biological losses, (2) are not treatable, (3) have limited range (endemic) or do not exist within Washington (exotic), (4) a repeatable robust means for their detection is recognized, and (5) a statewide surveillance program is in place for the pathogen. Pathogens that are considered regulated are as follows:

Regulated Exotic Pathogens[1]:

- *Oncorhynchus masou* virus (OMV)
- European viral hemorrhagic septicemia virus (EU. VHSV)

Regulated Endemic Pathogens:

Viral – Infectious hematopoietic necrosis virus (IHNV)

- Infectious pancreatic necrosis virus (IPNV)
- North American viral hemorrhagic septicemia virus (N.A. VHSV)

Parasite – *Myxobolus cerebralis*

[1] There are other serious fish pathogens that are not known to exist in Washington State that are not included in this list because there is not a statewide surveillance program in place for them (e.g. Infectious Salmon Anemia Virus). These pathogens may be added to this category in the future if new information becomes available regarding their distribution.

RELEASE – The liberation of captive fish into public waters of Washington State that results in them being free-ranging.

RELEVANT CO-MANAGERS – WDFW and Treaty Indian Tribes that could experience fish health impacts from gamete, egg, fish, or carcass movements within their area of concern.

REPORTABLE PATHOGENS – Fish pathogens that are of general interest and meet the following criteria: (1) have the potential to cause significant biological, or economic loss, (2) thought to have limited geographic range within Washington State, (3) there is limited ability to control, and (4) an accepted detection method exists for these pathogens. Reportable pathogens will be screened for at the discretion of the attending pathologists based on clinical signs.

Reportable pathogens include:

Viral – All replicating agents other than those listed as regulated pathogens.

Bacterial – *Piscirickettsia salmonis,*

Strains of *Yersinia ruckeri* and *Aeromonas salmonicida* that are resistant to oxytetracycline and/or Romet and strains of *Flavobacterium psychrophilum* that are resistant to oxytetracycline and/or florfenicol.

Parasites – *Tetracapsuloides bryosalmonae* (PKX)

Ceratomyxa shasta

Nucleospora salmonis

Cryptobia sp.

REPRESENTATIVE INDEX GROUP (RIG) – A lot of fish that is tested for regulated viral pathogens in lieu of the lot to be transferred. Criteria for a RIG are that it must be of equal or greater sensitivity to regulated viral pathogens than the lot that is to be transferred and it must have been exposed to the same water supply for a minimum of two months prior to being tested (see Appendix 8.2.2 for susceptibility table).

SANITIZE – The process of eradicating fish pathogens from equipment and transfer vessels. Recommended procedures are outlined in Section 6 of the Pacific Northwest Fish Health Protection Committee's Model Policy (PNFHPC 1989 or current edition).

SPAWNING CYCLE – The period of time covering spawning of all salmonids starting with spring chinook and ending with steelhead. One cycle is identified as starting July 1 and ending June 30 of the following year.

SURFACE WATER – All open waters containing fish that are not considered to be Regulated Pathogen Free as defined in this policy.

TRANSFER – Any movement of gametes, eggs, live fish, or carcasses into or within Washington State to include any movements between hatcheries, rearing facilities, watersheds, or Fish Health Management Zones.

WATER SUPPLY – The spring, well, stream, river, estuary, or other body of water used in the incubation/rearing of eggs or fish.

WATERSHED – Any body of water that meets one of the following three criteria:
(1) A geographically distinct river basin that has a separate saltwater entrance; (2) A collection of more than one adjacent river basins that have separate saltwater entrances that the Co-Managers have agreed to manage as one watershed. These basins are combined so that a major basin can support a smaller basin that has little production of its own. If transfers only occur from the major to the smaller basins, and one of the receiving basins has a detection of a

regulated or reportable pathogen, that finding will not change the pathogen history of the major basin; or (3) Significant tributaries within a large river basin that the Co-Managers have agreed to manage as an independent watershed for fish health purposes. A list of these watersheds is listed in Appendix 8.3.

8.2. SPECIES SUSCEPTIBILITY TO REGULATED ENDEMIC PATHGONS

8.2.1. Table showing species susceptibility to *M. cerebralis* infection (MacConnell 2004):

Partially Resistant/Refractory	Intermediate	Sensitive
Grayling	cutthroat trout	rainbow trout
coho salmon	brook trout	steelhead salmon
bull trout	chinook salmon	sockeye salmon
lake trout	Atlantic salmon	kokanee salmon
chum salmon	mountain whitefish	
pink salmon		
Dolly Varden		

Appendix C

Containment plans for pathogens of concern.

Site-Specific Containment Plans for Pathogens of Concern

A. Signalment:

The Co-Managers disease policy of 2007 dictates that all Co-Manager or Co-Operator hatchery facilities within WA state develop an exotic pathogen management plan to notify, contain, and mitigate circumstances where exotic pathogens are isolated. Exotic pathogens of concern include but are not limited to OMV, VHSV.

B. Procedure:

Basic tenants are being provided as guidelines since hatchery facilities have so many unique attributes. Use this document, various resources like the WDFW and Tribal Fish Health manuals or Pipers Hatchery Management in your endeavors to develop these plans. Plans should be developed in a cooperative effort with hatchery personnel, fish health staff, and policy level personnel.

D. Notification:

After isolation and confirmation of an exotic pathogen, the first step identified in the process is notification of hatchery staff, all technical and policy level personnel involved with the facility. Name the individuals and their alternates in your plan.

E. Containment

Contain entire facility, control movement of fish, hatchery staff, water, equipment, and predators. Activate all site-specific plans

Plans should address:

1. What if anything will be done to contain effluent, for example diversion, UV light, chemical treatments, pond cleaning, waste disposal?
2. Handling of mortality.
3. Specific sanitation protocols, site-specific equipment, disinfection stations, and clothing.
4. Barriers to ingress and egress to the site.
5. Plan to control predation, and escape of fish to the system.
6. Include performance assessment and tour of facility, correct problems as needed.

F. Magnitude

Assess the magnitude of the problem, (fish health) This could include:

1. Testing of other hatchery stocks.
2. Testing of wild stocks in the system.

3. Other hatchery systems in the water shed.

I. Disposition of affected populations

Follow directions of managers. Plan could include method of euthanasia and disposition of affected stocks.

J. Facility Disinfection;

All affected areas of the hatchery should be completely disinfected after fish are destroyed and removed. The plan should address:

1. Disinfection agent (or possibly a list of acceptable agents) Consider where to get it, how to store it, safety issues.
2. How to apply the disinfecting agent. Consider instructions for use (label, reference), equipment needed, protective gear, barriers needed to contain agent at intended site of action.
3. How to neutralize or inactivate agent.

K. Other aspects

1. File plan in convenient location.
2. Have all supplies for containment and sanitation procured and available.
3. The plans are to be maintained and re evaluated every 5 years, and whenever facility changes are made.

Appendix D

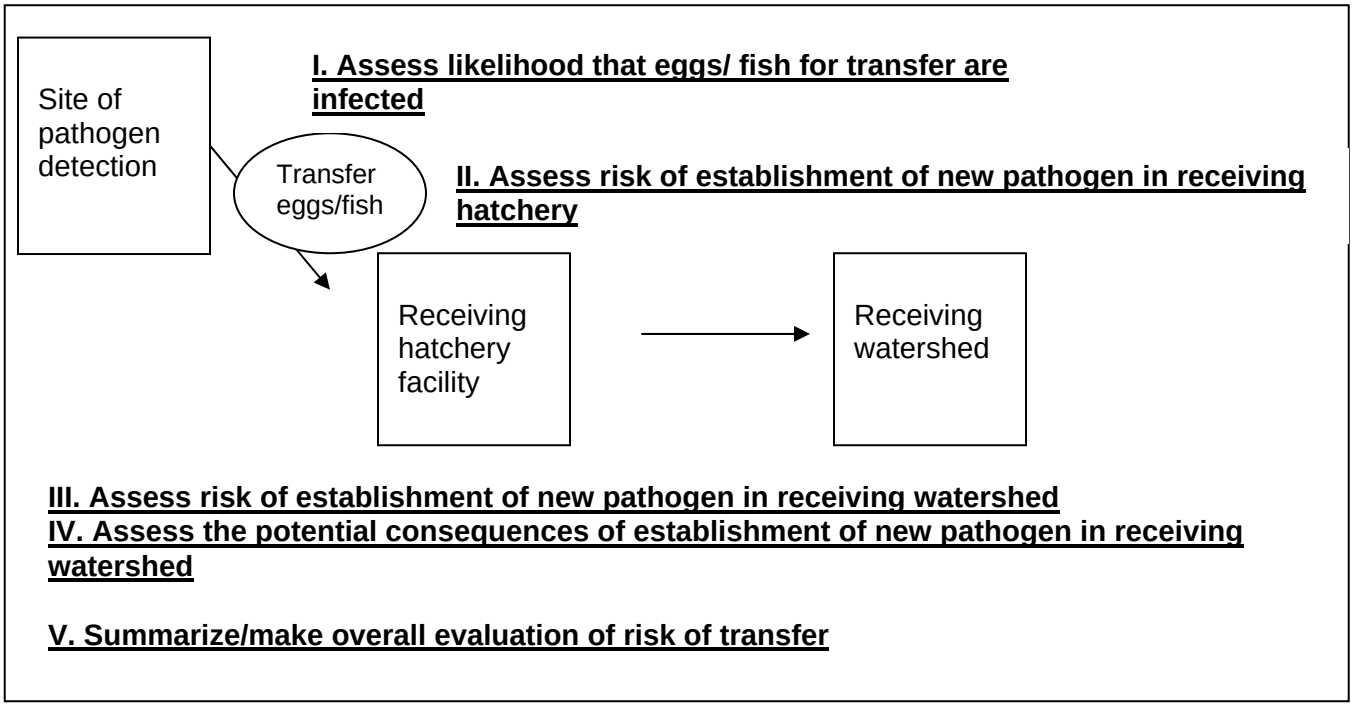
Risk Assessment Questionnaire

Risk Assessment Questionnaire **ver. 2/7/08 M. L. House, M. F. Chen**

Introduction:

This risk assessment protocol integrates information from laboratory studies, local geography and field conditions and history of pathogens in similar situations to:

1. Assess the likelihood that a particular lot of fish from a site of pathogen detection are infected and to what degree.
2. Describe the biological pathway(s) by which a proposed fish transfer could introduce a pathogen into an environment.
3. Provide a semi-quantative estimate of risk of pathogen transfer and establishment in the receiving hatchery and watershed.
4. Analyze in a systematic way the biological, social and economic consequences of pathogen establishment in a new environment.
5. Combine elements 1-4 into a recommendation on whether a particular fish transfer can be done at an acceptable level of risk.



Key to responses:

Likelihood	Descriptive definition
High (H)	The event would be very likely to occur
Moderate (M)	The event would occur with even probability
Low (L)	The event would be unlikely to occur
Negligible (N)	The event would almost certainly not occur
Unknown (U)	Not enough information to make a judgment

Brief Case History:

Pathogen detected:
Hatchery: Watershed:
Species pathogen detected in: Brood/ Return Year:
Life stage: Number of fish:
Population loss rate:

Species to be transferred: Brood Year:
Life stage: Number of eggs/ fish:
Potential receiving hatchery: Potential receiving watershed:

Brief summary:

Risk assessment prepared by:

I. Assess the likelihood that the lot of eggs/ fish being transferred is infected with the newly detected pathogen:

A. Disease Agent:

1. What is the level of disease observed at the sending hatchery (mortality, clinical infection, asymptomatic carrier)? Estimate the virulence of the pathogen at this time: H M L N U

B. Host factors at the site of detection (sending hatchery):

1. Fish from which pathogen was isolated:
   A. Is the level of susceptibility of the host species known? Y/N
   B. Are they at a susceptible life stage? Y/N
   C. Could they become carriers? Y/N
   D. Are they alternate or primary hosts? Y/N
   E. Where in the host is the pathogen located? List organs.
   F. What is the likelihood of vertical transmission? H M L N U
   G. Have these fish been previously vaccinated to reduce susceptibility? Y/N
   H. Are these fish being treated with a therapeutant likely to reduce susceptibility? Y/N

Summary of a-h: What is the likelihood that infected fish are shedding the pathogen? H M L N U

I. What is the likelihood that horizontal transmission is increasing the number of infected fish? H M L N U

J. Have the fish been in quarantine? Y/N
If yes, rate the effectiveness of current quarantine procedures in preventing transmission to other groups of fish at the hatchery: H M L N U

2. Lot of fish proposed for transfer:

A. Has the lot been tested and at what level?

B. Are the fish on a pathogen-free water supply? Y/N

C. Are these fish quarantined from the remainder of the facility? Y/N

D. Is the level of susceptibility of the host species known? Y/N

E. Are they at a susceptible life stage? Y/N

F. Could they be asymptomatic carriers? Y/N

G. Are they alternate or primary hosts? Y/N

H. What is the likelihood of vertical transmission in progeny of the transfer? H M L N U

I. Have these fish been vaccinated to reduce susceptibility? Y/N

J. Is vaccinating fish now an option? Y/N

K. Are these fish being treated with a therapeutant likely to reduce susceptibility or infection rate? Y/N

L. What is the chance that the treatment would eliminate this pathogen? N L M H U

3. For eggs to be transferred:

A. Is the level of susceptibility of the host species known? Y/N

B. Are the eggs being incubated on a pathogen-free water supply? Y/N

C. Are eggs a susceptible life stage? Y/N

D. Has vertical transmission been shown? Y/N

E. Is there a proven disinfection procedure? Y/N

F. What is the chance that disinfection will eliminate the pathogen? N L M H U

Summary question: What is the likelihood that the lot of eggs/fish moving into the receiving hatchery is infected with the newly detected pathogen? H M L N U

If this likelihood is Negligible (N), stop here. The risk of transferring the lot of eggs/ fish is negligible. If otherwise, continue with the assessment.

At the Receiving Facility:

II. Assess the risk of the transfer establishing the pathogen in the receiving facility

A. Pathogen History:

1. Have fish at the receiving hatchery been tested previously? Y/N
2. Is this pathogen presently detected at the receiving hatchery? Y/N
3. Has this pathogen been identified at this site previously? Y/N
4. Has this pathogen been identified in this watershed previously? Y/N
5. Does the receiving facility have a pathogen- free water supply? Y/N

Given the assessment of the pathogen's current presence or absence in the receiving watershed, would an introduction with transfer present a change in pathogen status? If "No", stop the assessment here. The impact of the pathogen's introduction to the receiving watershed will not change the status in the watershed and therefore not be an additional risk associated with the transfer of potentially infected eggs/ fish. If "Yes", continue with the assessment.

B. Presence of susceptible species:

1. List all susceptible aquatic animal species on site at the hatchery: (includes snails, leeches, frogs, etc…not just fish)
2. For each species, estimate the susceptibility in terms of likelihood of infection. H M L N U

   In calculating the answer, consider these factors:

   a. Are they at a susceptible life stage? Y/N
   b. Could they become carriers? Y/N
   c. Are they alternate or primary hosts? Y/N

Summary: Estimate likelihood of spread to fish species that are known hosts: H M L N U

C. Quarantine:

1. Will the transferred eggs/ fish be quarantined? Y/N
2. Will the effluent from the transferred eggs/ fish be disinfected? Y/N
3. Does any part of the receiving hatchery re-use of recirculated water without 100% effective disinfection? Y/N
4. Will the incoming eggs/ fish be effectively protected from predators that could move infected material (mortalities or moribund fish) to other areas of the facility? Y/N

Summary: What is the likelihood that the new pathogen could spread to other lots of fish at the receiving facility? H M L N U

If the likelihood is greater than Negligible (N) or Unknown (U) for the chance of spreading the new pathogen to other fish and this is not tolerable, stop assessment here and do not transfer fish. Assessment ends here. Otherwise, continue with assessment.

D. Vaccination:

1. Have any fish at the receiving hatchery been vaccinated previously? Y/N
2. Is vaccinating fish now an option? Y/N

E. Treatment:

If the new pathogen is detected at the receiving hatchery:

1. Is treatment possible or a viable option? Y/N
2. What is the best treatment available?
3. Will this treatment reduce the amount of the pathogen being shed? N L M H U
4. What is the chance that this treatment will eliminate the pathogen? N L M H U

F. Disinfection:

If the new pathogen is detected at the receiving hatchery:

1. Is there a proven disinfection procedure? Y/N
2. What would be the best disinfection procedure?
3. What is the chance that disinfection will reduce pathogen levels? N L M H U
4. What is the chance that disinfection will eliminate the pathogen? N L M H U

G. Impact of treatment and disinfection:

What is the level of harm associated with treatment/ disinfection to these downstream assets:

1. Wild fish/ invertebrates H M L N U
2. Fish or shellfish farms H M L N U
3. Vegetable farms or nurseries H M L N U
4. Municipal water supplies H M L N U

What is the likelihood that the pathogen will be successfully established at the receiving facility, given appropriate containment measures (treatment, vaccination, quarantine etc.) are employed: H M L N U

III. Assess the risk of the new pathogen becoming established in the receiving watershed

A. Presence of susceptible species:

1. List the most susceptible species (any phylum, any genera) in the watershed. Include at least one of each intermediate or alternate host (i.e. worms), if applicable.
2. For each species, estimate the susceptibility in terms of likelihood of infection. H M L N U

   In calculating the answer, consider these factors:

   a. Are they at a susceptible life stage? Y/N

   b. Could they become carriers?

   c. Are they alternate or primary hosts?

Estimate likelihood of spread to novel fish species: H M L N U

Estimate likelihood of spread to fish species that are known hosts: H M L N U

B. Hatchery effluent and environmental characteristics:

1. Is there reliable 100% effective disinfection of hatchery effluent? Y /N
2. What is the ratio of contaminated hatchery effluent to receiving water?
3. Is the effluent discharged directly into saltwater? Y /N
4. Is there hydrographic data, temperature range data that might help determine how likely the pathogen would be to gain access to the populations of potential hosts? Y /N
5. Are there barriers in a river system that would prevent passage of infected fish? Y /N

Summary: Overall, what is the likelihood that environmental conditions are favorable for establishment of the pathogen in the watershed? H M L N U

C. Activities that could move the pathogen:

1. What is the likelihood of the pathogen moving with:

Live fish transport	H M L N U
Carcass or mort movement	H M L N U
Surface water	H M L N U
Materials transported by birds or mammals	H M L N U
Pond sediments from hatchery	H M L N U

D. History

Does past history suggest successful transfer and establishment of this or a similar pathogen to similar watersheds? Y /N

What is the likelihood that the new pathogen will become established in the receiving watershed if it is introduced? H M L N U

IV. Assess the potential consequences of the new pathogen becoming established in the receiving watershed

A. Relevant Management Information:

1. What hatchery releases (date, species, numbers) have occurred in this watershed? list
2. The probability that previous hatchery releases introduced the pathogen into the watershed is:
   H M L N U
3. Are there archived samples from these releases that could be tested now? Y/N
4. Are there wild/ feral fish pathogen surveys in this watershed? Y/N
5. Are there archived samples from wild fish that could be tested now? Y/N
6. Are there any listed species in the watershed that could be impacted? Y/N

Review of 1-6: the likelihood that this is a new introduction or re-establishment of a dissipated pathogen is H M L N U

B. Checklist of human and terrestrial animal demographics and activities:

Have there been or are there any imminent transfers of fish in to or out of the watershed that should be evaluated? Y (list) or N

Are there private aquaculture facilities that might be impacted? Y (list) or N

Could commercial fishing or sport fishing activities increase spread of a pathogen? H M L N U

Could ongoing or planned fisheries activities such as tagging, smolt trapping, electro fishing or redd mining increase spread of a pathogen? H M L N U

Could scavengers/ birds spread infectious material by transporting dead /dying fish? H M L N U

C. Direct consequences: Fish and ecosystem health

Rate the likelihood of:

1. Infection of fish leading to disease or carrier state including the possible spread to new host species (see section I.B). H M L N U
2. Public/avian health consequences: potential for botulism if there is a fish kill. H M L N U
3. Fishing season reductions or closures. H M L N U
4. 4. Production losses, increased operating costs or facility closures – public aquaculture. H M L N U (consider carrier state effects on ability to transfer fish)
5. 5. Production losses, increased operating costs or facility closures – private aquaculture. H M L N U (consider carrier state effects on ability to market live fish)
6. Decrease in commercially or environmentally important aquatic populations due to mortality, reduced growth rate, or failure to reproduce, in known susceptible hosts. H M L N U
7. Decrease in populations of commercially or environmentally important species due to loss of prey species: this may include terrestrial/avian species as well as aquatic. H M L N U

Ecosystem consequence: The likelihood that exposure and establishment will result in direct consequence #1 and at least one other negative consequence (#2-7) make it a H M L N U risk to fish health which will have H M L N U consequence to the ecosystem.

Guidance for Consequence scoring: If the score on question 1 is N, then questions 2-7 are likely to score as N or L, but scoring M on question #1 raises the chances of higher scores on 2-7. Scores higher than N on questions 2-7 should have a cumulative effect: for example, an "M" score on questions 4 and 7 should result in a "H" rating on consequence to the ecosystem.

D. Combine the results of the first four sections for summary evaluation of risk for transferring eggs/ fish from site of detection of new pathogen. (Questions 1-4 are the same as the summary questions at the end of each section and are placed here to make the summary easier.)

1. Rate the likelihood that the lot of eggs/ fish moving into receiving hatchery is infected with the newly detected pathogen: H M L N U
2. Rate the likelihood that the pathogen will be successfully introduced to the receiving facility from a disease outbreak in the transferred eggs/ fish, given appropriate containment measures (treatment, vaccination, quarantine etc. are employed): H M L N U
3. Rate the likelihood that the new pathogen will become established in the receiving facility/ watershed if it is introduced: H M L N U

Need a summary question for 1-3 to use for "Likelihood of introduction and establishment" in the table.

4. The likelihood that exposure and establishment will result in direct consequence #1 and at least one other negative consequence (#2-7) make it a H M L N U risk to fish health which will have H M L N U consequence to the ecosystem.

(Use the second risk level in the chart below for "Consequences of establishment")

At this point the entry/exposure risks and the consequence of entry/exposure risk are combined by using the risk estimation matrix.

Risk Estimation matrix:

Likelihood of introduction and establishment:

H	U	N	M	H	Extreme risk
M	U	N	M	H	Extreme risk
L	U	N	L	M	H
N	U	N	N	N	L
U	U	N	M	M	H
	U	***N***	***L***	***M***	***H***

Consequences of establishment

Australia considers “Very low risk” as their acceptable level. We have simplified their scale by omitting “very low” and “extremely low” as too hard to distinguish between.

Negligible: acceptable level of risk
Low: debatable/ determine case by case
Moderate and above: unacceptable level of risk

Summary: The information that we have available regarding the detection of _____ (pathogen) at _____ (facility), it's potential release and the exposure of receiving waters to it, and the consequences of establishment of _____(pathogen) makes it a(n) E H M L N U risk to fish health (or ecosystem health) in the watershed. (E= extreme risk)

Regulated Pathogens to "test" in questionnaire:
Paramyxovirus
Reovirus
Piscirickettsia salmonis
Drug resistant *Aeromonas salmonicida*
Drug resistant *Flavobacterium psychrophilum*
Drug resistant *Yersinia ruckeri*
Tetracapsuloides bryosalmonae
Nucleospora salmonis
Ceratamyxa shasta
Cryptobia salmositica