

FY 2008-2009 F&W Program Accords (MOA) Proposal Review
NARRATIVE

YAKAMA NATION LAMPREY

Table 1. Proposal Metadata

Project Number	2008-470-00
Proposer	Confederated Tribes of the Yakama Nation
Title	Yakama Nation Pacific Lamprey Program (YNPLP)
Short Description	Assess status, abundance and distribution of Pacific Lamprey; develop a Yakama Nation Pacific Lamprey Program and the Yakama Nation Pacific Lamprey Restoration Plan, implement and monitor plans.
Province(s)	Columbia Gorge, Columbia Plateau, Columbia Cascade
Subbasin(s)	White Salmon, Wind River, Little White Salmon, Klickitat, Yakima, Crab Creek, Wenatchee, Entiat, Methow
Contact Name	Patrick Luke
Contact email	pluke@ykfp.org

Information transfer:

(A) **Abstract** – Little is known about the population status, biology or ecologic relationships of Pacific lamprey (*Lampetra tridentata*) within the Yakama Nation Ceded Lands (YNCLs) and areas of Usual and Accustomed harvest. However, it is apparent that the populations¹ throughout the YNCLs are on a markedly downward trend. Therefore, the purpose of this proposed work is to 1) collect and report critical information to evaluate status, abundance and distribution and other biologic characteristics of Pacific Lamprey, 2) identify known and potential limiting factors for Pacific lamprey within Columbia River tributaries within the YNCLs, and 3) develop and implement Pacific lamprey restoration actions and evaluate the effects of these actions. The newly envisioned Yakama Nation Pacific Lamprey Program (YNPLP) takes a phased approach in its development. The central efforts of Phase 1 are to initiate field surveys, begin to obtain relative abundance and distribution information and to establish local and regional coordination for future efforts. Phase 1 will occur in years 2009-2010, focus on long-term YNPLP development and begin identification of potential limiting factors. Most efforts will initially focus in the Klickitat and Yakima subbasins but will likely extend into the Wenatchee, and Entiat subbasins as time permits. Phase 2 (2011 – 2012) of the YNPLP will continue Phase 1 efforts but will expand the geographic scope to the Methow, White Salmon, Little White Salmon and Wind subbasins. During this time period additional emphasis will be placed in the documentation of known and potential limiting factors and development of a comprehensive Yakama Nation Pacific Lamprey Restoration Plan. Phase 3 (2013 – 2017) will continue to expand the program geographically, but will shift the emphasis from initial qualitative surveys documenting general distribution and relative abundance to establishing more quantitative abundance estimates and implementing habitat restoration actions.

¹ The Yakama Nation recognizes that the structure of Pacific lamprey population(s) remains largely unknown within its range and within the Columbia River Basin.

The goal of the Yakama Nation Pacific Lamprey Program is to restore tributary habitats to a functional level that will support robust natural production of Pacific lamprey within the YNCLs and in the Usual and Accustomed areas where our ancestors have fished from time immemorial. The Yakama Nation will work closely with the Columbia River Inter-Tribal Fish Commission Tribal governments and other state and federal fisheries agencies towards a more comprehensive goal of restoring Pacific lamprey to sustainable, harvestable levels throughout the historical range and in all tribal usual and accustomed areas.

(B) Technical and/or scientific background: The recent Columbia River Basin Accords acknowledge the need to better understand biologic and ecologic characteristics of Pacific lamprey and to protect and restore this species in the Columbia River Basin. The importance of Pacific lamprey to the Yakama Nation and many other Northwest Tribes and the problem of steadily declining runs and harvest opportunities are issues widely acknowledged in numerous documents produced by both tribal and non-tribal entities (Close et al. 1995; Jackson et al. 1996; Jackson et al. 1997). The “*Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin*” (Formal Draft, May 15, 2008) is one of the most recent documents to thoroughly discuss this issue. What is not well understood are the ecological consequences associated with the decline of these fish in both marine and freshwater environments. Compounding the problem is the fact that we have very little information about this species. One thing is certain; run size over time is declining. This past year (2008) counts at Bonneville Dam counting windows are at an all time low since counting began at the federal hydropower projects. Substantive information needs and regional cooperation are apparent. Improved passage through the mainstem Columbia and Snake River hydroelectric projects and assessment and implementation of restoration actions within Columbia River Basin (CRB) tributaries are both urgent and critical.

Background: Once-abundant Pacific lamprey (*Lampetra tridentata*) populations are severely depressed or believed to be extirpated in many of the mid- and upper Columbia and Snake River tributaries (Close et al. 1995; Jackson et al. 1996; Jackson et al.). The Pacific lamprey is an important part of the food web of north Pacific ecosystems, both as predator and prey. Lampreys are also a valuable food and cultural resource for Native Americans of the Pacific Northwest. Depressed upriver lamprey runs have affected treaty-secured fishing opportunities by forcing the four Columbia River treaty tribes to gather this traditional food fish in relatively few lower Columbia River locations (Close et al. 1995; Claire 2004).

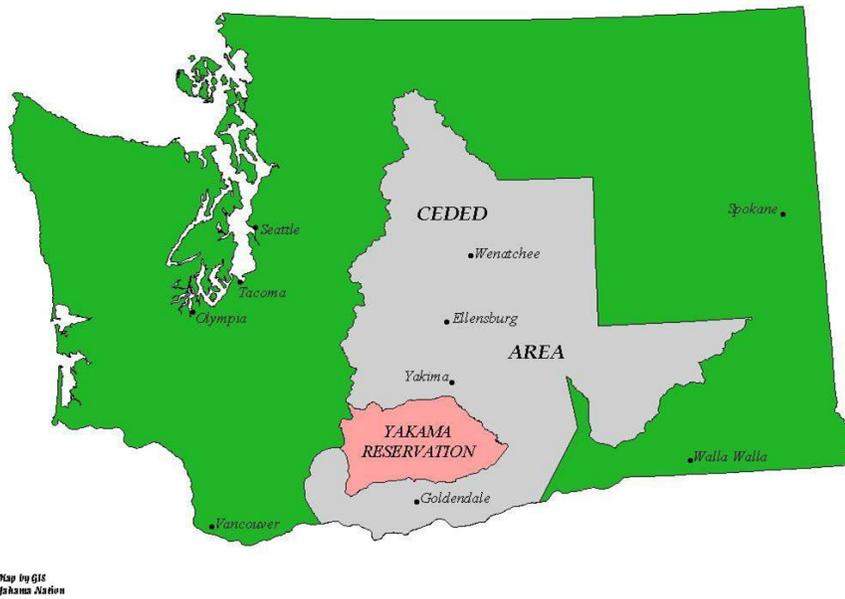


Figure 1. Yakama Nations Ceded Lands from 1855 Treaty with the United States in Walla Walla, Washington.

State, federal, and tribal agencies have voiced concerns for Pacific lamprey in the Columbia River Basin (Anglin et al. 1979; Hammond 1979; Beamish and Northcote 1989; Claire 2003; Moser and Close 2003). To date, however, insufficient attention has been given to assessment of lamprey populations although documentation of the reasons for declines in populations (see Pletcher 1963; Beamish 1980; Moser et al. 2002; Meeuwig et al. 2006) managers still lack critical information about its life history and basic biology. Beginning in 1993, the Oregon Department of Fish and Wildlife designated Pacific lamprey at risk of being listed as threatened or endangered. In 2003, the U.S. Fish and Wildlife Service (FWS) were petitioned to list Pacific lamprey under the Endangered Species Act. The petition did not contain sufficient information to warrant a status review, and did not result in a listing. Pacific lamprey are currently designated a “species of concern” by the FWS. In 2008, the FWS initiated the Pacific Lamprey Conservation Initiative. The Treaty Tribes of the Columbia River (Yakama, Nez Perce, Umatilla and Warm Springs) have been concerned about lamprey declines (Close et al. 1995) and the lack of harvest opportunities in the Columbia Basin for many years (Anglin et al. 1979).

In May 2008, the Columbia River Intertribal Fish Commission (CRITFC) released the Draft Tribal Pacific Lamprey Restoration Plan. This Draft CRITFC Plan is the first document to comprehensively outline key issues and actions within the Columbia River Basin. Although the primary goal of the Draft CRITFC Plan is to restore Pacific lamprey within the region, another important aspect stresses the urgent nature of regional cooperation to act on what we know and to coordinate in a more comprehensive manner to avoid ESA listing of the species.

The initiation of the Yakama Nation Pacific Lamprey Program is an important extension of the Draft CRITFC Plan (a final plan is expected to be completed in spring, 2009). The Yakama Nation intends to expand upon the habitat restoration objectives described in the CRITFC

Restoration Plan. Through funding received from the Accords and through local and regional cooperative relationships, we anticipate surveying and assessing most of the sub-watersheds within all of the subbasins contained in the YNCLs. Working closely with other Tribal and State fisheries agencies we intend to continuing development and use of standardized survey methodologies to measure and describe habitat conditions, relative abundance and distribution of adults and juvenile Pacific lamprey. Genetic samples will also be taken to contribute to our overall understanding of this population within the Columbia River Basin.

Program Goal and Objectives

The goal of the Yakama Nation is to restore natural production of Pacific lamprey to a level that will provide robust species abundance, significant ecologic contributions and meaningful harvest within the Yakama Nations Ceded Lands and in the Usual and Accustomed areas. The Yakama Nation intends to achieve this goal by developing a long-term Management and Action Plan specific to Pacific lamprey in close cooperation with local and regional government entities and consistent with efforts associated with the CRITFC Pacific Lamprey Tribal Recovery Plan, the U.S. Fish and Wildlife Service Conservation Initiative, the Lamprey Management Plans that have been or are currently being developed through the FERC relicensing processes of Chelan County, Douglas County and Grant County Public Utility Districts and other ongoing efforts conducted by the Nez Perce, Umatilla, and Warm Springs Tribes.

The YNPLP is just beginning its first year of development. And there is a rapid and urgently evolving regional awareness of the issues surrounding these fish. Basic information is needed and there is much work to be completed in regional coordination in data collection methods, data interpretation and reporting formats. Given this, it is impossible to describe all YNPLP aspects over the next 10-years. Adaptive Management will play a significant role in the development and implementation of the YNPLP.

The Yakama Nation Pacific Lamprey Program will be developed over three phases with Phase 1 occurring in years 2009-2010, Phase 2 in years 2011-2012 and Phase 3 anticipated in years 2013-2017. In general, Phase 1 will initiate the YNPLP and efforts will center on initiating surveys, refining regionally accepted survey protocols, developing cooperative relationships with local and regional entities and continuing to develop and refine YNPLP objectives and future work elements. Phase 2 will continue the Phase 1 effort and will expand our work geographically. During Phase 2 we will also emphasize the identification of habitat limiting factors within the various subbasins and begin development of a comprehensive and detailed restoration action plan for each of these subbasins. In Phase 3, we anticipate a greater emphasis in actively enhancing and restoring Pacific lamprey habitats and documenting progress, as well as more refined, quantitative estimates of abundance and distribution of adult and juvenile lamprey within key watersheds of the YNCLs.

Through 2009-2012 the YNPLP will obtain basic information relevant to Objectives 1–6, as described below, by completing preliminary field surveys, beginning in the Klickitat, Yakima, Wenatchee and Entiat subbasins. Over time, as our Program grows in experience and regional coordination increases, we intend to expand field surveys to other streams and subbasins and also, more aggressively continue work relevant to Objectives 7 and 8. Throughout this timeframe the YNPLP will continue local and regional coordination with key Parties interested

in lamprey restoration as a primary means to gain a high level of efficiency and effectiveness toward achieving our goal.

Program Objectives over the next 10-years:

- 1) Document historic distribution of adult lamprey from historical records, literature reviews and oral interviews and compare with known current distribution.
- 2) Participate in and contribute to regional consistency in data collection, data management, analysis and reporting.
- 3) Document current status of larval Pacific lamprey with presence/absence surveys to determine distribution of recruitment.
- 4) Document biologic condition, migration behaviors and environmental cues that trigger migration for both adult and juvenile Pacific lamprey.
- 5) Identify habitat characteristics that are preferred at various life stages and determine the extent these habitats are available and are being utilized (habitat mapping).
- 6) Identify and inventory all known and potential limiting factors, and current threats existing in tributary habitats. Develop and implement a Pacific Lamprey Action Plan for the following subbasins: Methow, Entiat, Wenatchee, Crab Creek, Yakama, Rock Creek, Klickitat, White Salmon, Wind, and Little White Salmon (including all perennial tributary streams to the Columbia River within the YNCLs).
- 7) To increase larval abundance in tributary streams, implement a pilot adult Pacific lamprey translocation program from main-stem Columbia River hydro-electric projects into various subbasins (to be determined) and evaluate methodology and potential biological benefits and risks of expanding this program as appropriate.
- 8) Evaluate the potential for and participate in the development of supplementation / artificial propagation techniques of Pacific lamprey.

(C.) Rationale and significance to regional programs: Within the Columbia River Basin, state and federal natural resource entities have taken a heightened interest in the downward trend of Pacific lamprey populations. Tribal governments and other local and regional entities share a growing interest in determining how best to coordinate and organize efforts to better understand Pacific lamprey and develop a comprehensive plan to stop their decline and aid their recovery. The Yakama Nation Fisheries Resource Management Program is closely involved with at least four key regional programs, described below and fundamental to Pacific lamprey recovery efforts.

Columbia River Intertribal Fish Commission Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin (Formal Draft, May 15, 2008)

The emphasis of this Tribal Restoration Plan is to provide an explicit and timely path, including specific actions that can be implemented in the next ten years for both the mainstem Columbia/Snake Rivers and associated tributary streams. The ultimate goal is restoration of Pacific lamprey to levels supportive of their unique cultural and ecosystem values. The primary objectives include 1) improving mainstem passage and survival, 2) improving tributary habitat conditions, 3) implementing translocation/re-introduction actions, 4) continuing research to improve our understanding of their life history and biology, and 5) coordinate public education and other outreach programs to communicate awareness of Pacific lampreys current status, implementing action plans to restore Pacific lamprey throughout the CRB, and the consequences of failing to act. The tribes believe action must be taken now, despite a general paucity of information about the life history and population dynamics of the species.

U.S. Fish and Wildlife Service Pacific Lamprey Conservation Initiative

According to the FWS, “the Pacific Lamprey Conservation Initiative is an effort presently led by the U.S. Fish and Wildlife Service (FWS) to facilitate communication and coordination relative to the conservation of Pacific lampreys throughout their range. The goal of the initiative is to develop a Pacific Lamprey Conservation Plan that will lead to restored Pacific lamprey populations and improvement of their habitat”.

In a document that briefly describes the Conservation Initiative; the FWS recognizes that “little is known about Pacific lampreys. While there appears to be both a decline in distribution and abundance in the western U.S., local distribution and abundance information is lacking. In addition, little is known about their specific life history strategies, habitat use, population structure or the effects of various threats. A collaborative conservation effort will reduce the unknowns and facilitate opportunities to address threats, restore habitat and improve distribution and abundance of Pacific lampreys”.

The expected outcomes of the Conservation Initiative, as stated by the FWS are as follows:

- A description and tracking of current knowledge of Pacific lamprey life history, biology, and habitat requirements.
- Identification of Pacific lamprey populations, and their current distribution, abundance, and population structure.
- A range wide map of historical and current Pacific lamprey distribution.
- Description of known threats and reasons for decline.
- Identification and implementation of a strategy for restoring Pacific lamprey populations.
- Identification of prioritized conservation and restoration actions that result in improvements in conditions for all life history stages including; passage, ammocoete habitat, spawning habitat, and downstream migratory conditions.
- Updated, described, and prioritized research, monitoring and evaluation needs – both regionally and range wide.

Northwest Power and Conservation Council

According to the Columbia Basin Fish and Wildlife Authority, “Pacific Lamprey has been named as a focal species by subbasin planners in 13 subbasins. Status and trends data are available for this species in 3 subbasins. Ten subbasins have no data available. Pacific Lamprey is not a federally protected species, though it is listed as a "species of concern" in 10 subbasins”.

Subbasin Plans for the Klickitat, Yakima, Crab Creek, Wenatchee, Entiat and Methow subbasin were developed by, or in coordination with the Yakama Nation and submitted to the Northwest Power and Conservation Commission in May, 2004. In all but the Crab Creek planning documents, Pacific lamprey are listed as a Focal Species of the plans or recognized as a species important to the management of the subbasin. In general, these Subbasin plans recognize 1) a significant lack of information regarding Pacific lamprey and a need to obtain a basic understanding of this species within the subbasins, 2) habitat conditions that are possibly degraded relative to specific life history needs of this species, 3) a need for habitat evaluations specific to Pacific lamprey, and in the case of the Wenatchee subbasin, a need for “*evaluations addressing artificial propagation of this species [to] be included within a larger and similar effort throughout the Columbia Cascade Province*”.

Lower Columbia River Tribal Programs

The Yakama Nation appreciates the past and ongoing work by the Confederated Tribes and Bands of the Warm Springs, the Confederated Tribes and Bands of the Umatilla Indian Reservation, and the Nez Perce Tribes, most of which is funded through the BPA Fish and Wildlife Program. The Yakama Nation Pacific Lamprey Program will continue to work closely to learn from and to support these other tribal efforts. Tables 2 and 3 below identify past and ongoing Projects the Warm Springs and Umatilla Tribes have received funding for, related to Pacific lamprey restoration efforts.

Table 2. Relationship to existing projects:

Confederated Tribes of the Warm Springs Reservation of Oregon

BPA Project #	Project Title	Relationship (brief)
19930400	Fifteen mile Habitat Restoration Project	Data collection throughout the system, habitat restoration beneficial to lamprey
199805304 199805305	Hood River M&E	Assist with status monitoring including rotary screw traps operations. Help address limiting factors (e.g., H ₂ O temps, potential identification of barriers)
199802100	Hood River Habitat Program	Help address limiting factors increase connectivity to upper subbasins, provide lamprey distribution potential
200201600	Evaluate the Status of Pacific Lamprey in the Deschutes Basin	Complementary project – information can be exchanged between project staff and sampling plans developed for the Deschutes will be u

Table 3. Relationship to existing projects:

Confederated Tribes of the Umatilla Indian Reservation

BPA Project #	Project Title	Relationship (brief)
1990-005-00	Umatilla Hatchery - M&E	Enumeration, supplementation techniques, acclimation facilities
1990-005-01	Umatilla Basin Nat Prod M&E	Production Project shared with the Lamprey Project
1994-026-00	Pacific Lamprey Research and Restoration	Historical data, status, distribution
2002-037-00	Freshwater Mussels In River	Freshwater mussels and lamprey require similar habitat and perform similar ecosystem functions

Nez Perce Tribes

In 2006, the Nez Perce Tribe (NPT) initiated a Pacific lamprey restoration initiative. In the winter 2007 the NPT transported adult lampreys that were collected in the dewatered ladder at John Day Dam to Nez Perce Tribal Hatchery. Later on, in the same month the NPT

transported more adult lampreys that were collected in the dewatered ladder at The Dalles Dam to NPT Hatchery. In an effort to control Furunculosis, the lampreys were injected with oxytetracycline. Adults were then transferred into the M&E tanks located adjacent to the NPT Trout Ponds. The adults were held until the spring, and released by mid-May. Prospective release streams are Lolo Creek, Newsome Creek, Orofino Creek, and Asotin Creek (per communication Elmer Crow, NPT). Comparable projects have determined lamprey status in the Clearwater Basin, ID (BPA Project 200002800); and Cedar Creek, WA. (BPA Project 200001400). The results of these accumulated projects address “imminent critical uncertainties” identified by the Columbia Basin Lamprey Technical Working Group (CBLTWG).

Memorandum of Agreement among the Umatilla, Warm Springs and Yakama Tribes, Bonneville Power Administration, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation.

As stated in the Introduction of the 3-Treaty Tribes – Action Agency Agreement (April 4, 2008) “*The Bonneville Power Administration, the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation and the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes and Bands of the Yakama Nation, and the Columbia River Inter-Tribal Fish Commission have developed this Memorandum of Agreement through good faith negotiations. This Agreement addresses direct and indirect effects of construction, inundation, operation and maintenance of the Federal Columbia River Power System and Reclamation’s Upper Snake River Projects, on fish resources of the Columbia River Basin. The Action Agencies and the Tribes intend that this Agreement provide benefits to all the Parties*”.

The Parties of this Memorandum of Agreement (Agreement) “*understand that the Pacific Lamprey is a species of fish that is significant to the wellbeing of the Tribes, who use these fish for food and medicine*”. The Parties recognize “*Lamprey abundance has diminished in the Columbia Basin in the last 30 years and this diminishment is of high concern to the Parties*”. The Agreement calls for the Parties to work together and “*to combine Action Agencies, Tribal, and other agency lamprey actions into a comprehensive lamprey improvement program*”.

Actions identified in this agreement include commitments by the Army Corps of Engineers to “*continue improving adult lamprey migratory conditions at mainstem FCRPS hydropower projects*” and to “*continue to monitor the passage of juvenile lamprey collected at projects with juvenile fish bypass facilities, and over time, replace turbine intake bar screens (when in need of replacement) with bar screens that have smaller gaps between the bars, as warranted to further protect migrating juvenile lamprey*”. With regard to measuring juvenile survival through the FCRPS projects, the Army Corps also agrees “*if and when the technology to meet juvenile lamprey active tag criteria becomes available, and as warranted, determine passage routes, outmigrant timing and survival of juvenile lamprey through FCRPS mainstem dams*”.

Also, as stated in the Agreement, “*beginning in 2008, and concluding in 2010, [Bureau of] Reclamation will conduct a study, in consultation with the Tribes, to identify all Reclamation projects in the Columbia Basin that may affect lamprey. The study will also investigate potential effects of Reclamation facilities on adult and juvenile lamprey, and where appropriate, make recommendations for either further study or for actions that may be taken to*

reduce effects on lamprey. The priority focus of the study will be the Umatilla and Yakima projects and related facilities.

Beginning in 2008, Reclamation and the Tribes will jointly develop a lamprey implementation plan for Reclamation projects as informed by the study above, the tribal draft restoration plan, and other available information. The plan will include priority actions and identification of authority and funding issues. It will be updated annually based on the most recent information. Reclamation will seek to implement recommended actions from the implementation plan”.

In addition, BPA has obligated funding to the Tribes for the following investigations associated with this Agreement:

Columbia River Intertribal Fish Commission (annual allocation of \$575,000)

- Lamprey Mainstem passage design assistance

Confederated Tribes of the Umatilla Indian Reservation (annual allocation of \$500,000)

- Pacific Lamprey Research and Restoration Project – including translocaton
- Lamprey outmigration

Confederated Tribes of the Warm Springs Indian Reservation of Oregon (annual allocation of \$541,000)

- Willamette Falls lamprey escapement and population status study
- Evaluate the status of Pacific Lamprey in the Deschutes Basin
- Determine status and limiting factors of Pacific Lamprey in 15mile and Hood basins

Confederated Tribes and Bands of the Yakama Nation (annual allocation of \$250,000)

- [Investigate and improve Pacific lamprey] Ammocetes densities
- Lamprey presence /absence and other baseline in Upper Columbia and Yakima
- [Investigate] Translocation and [collect and evaluate] other data [related to lamprey]

(D) Relationships to other projects: As mentioned above, the YNFRMP is working closely with regional efforts to design and implement future Pacific lamprey restoration actions. In concert with these regional efforts, the Yakama Nation Fisheries Resources Management Program is participating in other important activities, described below, that are occurring at a more local scale. These actions are also fundamental toward regional Pacific lamprey recovery efforts.

Mid-Columbia Public Utility Districts: The Yakama Nation has been, and continues to be closely involved with the Federal Energy and Regulatory Commission (FERC) relicensing efforts of the Mid-Columbia Public Utility Districts (PUD), specifically, the 1) Grant County PUD Priest Rapids Project, 2) Chelan County PUD Rocky Reach Project and 3) Douglas County PUD Wells Project. An important component of the relicensing of these Projects is the inclusion of Pacific Lamprey Management Plans (PLMP), which are incorporated into each of the PUD’s new license conditions. Although each of the PLMPs will primarily focus on the FERC defined Project Area, there is acknowledgement within each of the Plans that regional coordination will be important and beneficial. The goals and objectives for each of these Project PLMPs are:

Wells Pacific Lamprey Management Plan (PLMP)

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas, in

collaboration with the Aquatic Settlement Working Group, has agreed to implement several Pacific lamprey Protection Mitigation and Enhancements (PMEs) in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

- Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey.
- Objective 2: Identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific lamprey.
- Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the mid-Columbia River Basin. The PLMP is intended to be consistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

Rocky Reach Pacific Lamprey Management Plan (PLMP)

The goal of the PLMP is to achieve No Net Impact (NNI) on Pacific lamprey by measuring ongoing Project-related impacts, if any, on Pacific lamprey; implementing appropriate and reasonable measures to reduce or eliminate such impacts; and implementing on-site or off-site measures to address unavoidable impacts. The PLMP uses Adaptive Management to meet this goal and is intended to be consistent with other management plans in the mid-Columbia region.

- Objective 1: Measure any ongoing Project impacts on upstream and downstream passage of adult Pacific lamprey, and eliminate those impacts to the extent appropriate and reasonable;
- Objective 2: Measure any ongoing Project impacts on downstream passage of juvenile Pacific lamprey, and eliminate those impacts to the extent appropriate and reasonable;
- Objective 3: Measure any ongoing Project impacts on the existing reservoir habitat used currently by juvenile Pacific lamprey, and eliminate those impacts to the extent appropriate and reasonable; and
- Objective 4: Identify and implement measures to address unavoidable impacts to achieve NNI.

Priest Rapids Pacific Lamprey Plan (PLMP)

The goal of the PLMP is to identify ongoing Project-related impacts on Pacific lamprey; implementing reasonable and feasible measures to reduce or eliminate such impacts; and implementing on-site or off-site measures to address unavoidable impacts.

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

- Objective 1: To achieve No Net Impact (NNI). Identify, address, and fully mitigate Project effects to the extent reasonable and feasible;
- Objective 2: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for adult upstream and downstream migration;

- Objective 3: Provide safe, effective, and timely volitional passage (as defined by the PRFF) for juvenile downstream migration;
- Objective 4: Avoid and mitigate Project impacts on rearing habitat.

(E). Project history (for ongoing projects)

New project

(F). Proposal biological/physical objectives, work elements, methods, and metrics

Objective 1: Document historic distribution of adult lamprey from historical records, literature reviews and oral interviews and compare with known current distribution.

Work Element 157 Consolidate, summarize cultural and scientific information

Rationale Historic information concerning lamprey distribution has not been collected, compiled and summarized for the Yakama Nation Ceded Lands or in areas where Usual and Accustomed harvest of this species was practiced. This information is expected to provide a backdrop of where fish once existed but may not exist in the present.

Approach Inventory, document and summarize historical records and integrate information from various organizations to contribute to and support the Yakama Nation Pacific Lamprey Program.

Methods Coordinate with and collect information at a regional scale from tribal, state, federal and non-government organizations involved with Pacific lamprey research and management. Conduct oral interviews with tribal fishers, and elders who have invested time preparing lamprey for their staples.

Task 1.1 Compile information (e.g., oral histories, historic field data files, and existing biological sampling efforts) and management records which would help define past and current distribution of lamprey in tributaries.

Task 1.2 Distribute information, peer review and comments to other fishery management agencies, as appropriate.

Task 1.3 Enter information into newly assemble data base, summarize for future reports.

Objective 2 Participate and contribute to regional consistency in data collection, data management, analysis and reporting.

Work Element 162 Participate in regional efforts

Rationale Most aspects of Pacific lamprey data collection, management and analysis are in a formative stage. Consistency across the region will provide for efficiency and much greater power and confidence in data analysis and interpretation. Because the Yakama Nation is just now initiating a Pacific Lamprey Program (YNPLP) we will coordinate and work closely with, and will use standard methods adopted by other tribal and government entities.

Approach The Yakama Nation intends to participate and contribute to ongoing regional efforts including the CRITFC Tribal Pacific Lamprey Recovery Plan, the USFWS Conservation Initiative, FCRPS lamprey mitigation efforts, Mid-Columbia PUD lamprey mitigation efforts, and the CFWA lamprey technical workgroup. The results of Yakama Nation monitoring and evaluation activities will be presented in annual reports and presented at annual workshops. At this point in time, we intend to store information in Streamnet and on the Yakima-Klickitat Fisheries Program website at www.ykfp.org. Data will also continue to be presented in progress (annual) reports to BPA.

Methods The Yakama Nation, in collaboration with other Tribal and regional fisheries agencies, will continue development of data collection and management protocols in 2009. The intent is to make all data compatible regardless of origin. The Yakama Nation intends to use the framework provided by Mr. Bruce Schmidt (Streamnet) presented in the CRITFC Pacific Lamprey Tribal Recovery Plan (May 15, 2008). A process to implement the following tasks will be developed in the coming months.

- Task 2.1** Identify and agree on the specific key metrics needed to measure lamprey abundance and distribution.
- Task 2.2** Identify and agree on the specific sampling methodologies that will be employed by all cooperating tribes and agencies to measure the various key metrics.
- Task 2.3** Develop a common list of data definitions and codes for use in recording and managing the data related to the key metrics.
- Task 2.4** Develop a data management plan that outlines the approaches to managing the resulting data, including:
- Where the data will reside.
 - How to consolidate data for wide scale analysis.
 - What data quality assurance procedures will be employed?
 - How the data will be maintained and updated (process used) and who will be responsible.
 - What formats and platforms will be used.
 - How the data will be shared and with whom, and whether there are any limitations on dissemination of the data.
 - Procedures for summarization and analysis of the data.
- Task 2.5** Develop metadata (information describing the data) for each data set related to the key metrics.
- Task 2.6** Develop standard data recording forms for use by all samplers for each key metric. Develop a standard data entry template for data collected in the field, and explore the feasibility of using mobile tools for direct data entry in the field.
- Task 2.7** Explore the feasibility of developing a common database system to house the data resulting from these sampling efforts. Features to consider include: the ability for data originators to directly enter, review and manage their data.
- Task 2.8** Convene workshop to disseminate findings/information to regional lamprey folks

Objective 3: Document current status of adult and juvenile lamprey with regard to distribution and relative abundance.

Work Element 157 Habitat surveys and abundance and distribution surveys

Rationale Distribution and relative abundance are primary characteristics of population status within subbasins. In the short term we are planning surveys under the assumption that it is most important to establish lamprey presence/absence in critical areas of potential habitat protection and/or restoration, and in areas we believe primary limiting factors exist. Our intention is to establish upper limits of lamprey distribution within key watersheds identify areas where production within the subbasins is greatest and identify areas where production is lacking but has high potential. This information will inform prioritization of lamprey restoration actions to be developed under Objective 5.

Approach Electro-fishing will be the primary means for determining presence, absence and relative abundance of juvenile lamprey. Sampling will include establishing upper ranges of ammocoete distribution based upon areas of known useable habitat and professional knowledge. Long-term monitoring index sites will be established. Methodology for determining size and frequency of index sites will be selected with a strata randomized design to be determined in 2009. Due to problems with existing sampling procedures, and an interest to survey a large geographic range in a relatively short time-frame (five years), we intend to determine relative abundance of juvenile lamprey, but not absolute abundance. All information will be stored in a relational database and linked to a Geographical Information System (GIS) spatial program.

Redd surveys will be the primary initial means to document presence, distribution and relative abundance of adults. Redd survey protocols will be determined in coordination with WDFW, USFWS and Tribal fisheries agencies. Yakama Nation staff is exploring opportunities with Mid-Columbia PUDs to employ radio tags on adults as a means to help identify holding and spawning areas, and other migration behavioral attributes.

Methods A sampling design was developed and successfully utilized by Torgersen and Close (2001) to document larval lamprey distribution and habitat in the John Day subbasin. The Yakama Nation intends to adopt the framework of this design and other methods being used by the Confederated Tribes of Warm Springs Reservation of Oregon (CTWSRO).

Prior to implementing surveys, detailed maps of stream habitats will help define focal areas of study in suspected suitable larval lamprey habitat (stream surveys and other GIS-based information). In general, electro fishing will be conducted starting at the mouth and continue upstream until the upper bounds of the larval lamprey distribution has been identified. Due to potential patchy distribution, surveys will be conducted up to 1 river kilometer above where the distribution is believed to stop. Once larval distribution has been mapped, a hierarchical stratified sampling design will be used to determine habitat use. The sampling design was developed and successfully utilized in the Deschutes Subbasin by CTWSRO Graham and Bruno 2004. It will consist of three tiers- Level I: stream reach, Level II: transect and Level III: subsample.

Level I: Each stream will be divided into 5 km reaches from the mouth to the upstream extent of perennial stream flow. Reaches will be identified using 1:75,000 quadrant maps digitized in Arc View. Suspected suitable habitat within each reach will be identified using existing stream surveys. Within each reach, one 60 m long sampling point will be randomly selected in portions of the reach containing suspected suitable habitat. The location of each sample reach will be recorded with GPS equipment.

Level II: Six latitudinal transects from the left bank to the right bank will be placed 10 m apart once the number of focal areas have been mapped, then the number of sampling points and the number of transects within each sampling point will be evaluated to ensure the sample size will provide adequate statistical power within the sampling point.

Level III: Two sub-samples will be surveyed along each transect. A 1-square meter area sub-sample will be randomly selected within the first 3 wadeable meters of each stream bank. If the stream is less than 3 m wide (wetted channel width) sub-samples will be located successively in an upstream direction with approximately 1 m between sub-samples. An AbP-2 Wisconsin electro fishing unit, specifically designed to capture larval lamprey, will be used to sample each Level III sub-sample (O'Neal 1987). The electro fisher will be set to deliver a constant delivery of 3 pulses s^{-1} (125 volts DC) at a 25% duty cycle, with a 3: 1 burst pulse train to draw larvae from the substratum (Weisser & Klar, 1990). Two electro fishing passes of 90 seconds will be applied to each sub-sample. Captured lamprey will be anesthetized with buffered MS-222 (tricaine methanesulphonate @ 250 mg L^{-1}) and identified on the basis of caudal pigmentation patterns (Richards, Beamish & Beamish, 1982), and total length measured (± 1 mm) before specimens are returned to the stream after recovering from anesthesia. Larval lamprey distribution and habitat data from Level I, II, and III sampling will be integrated and displayed using GIS.

Level I habitat and water quality data will be summarized using basic descriptive statistics software. Potential associations between larval lamprey presence and physical habitat characteristics will be evaluated at Level II and III using multiple logistic regression and multivariate analyses. Results will relate distribution of larval lamprey to stream characteristics within the range of available habitats.

- Task 3.1** Develop methodology for identifying potential juvenile index sites. Identify and map potential juvenile index sites. Identify potential 2009 survey locations.
- Task 3.2** Establish field safety and survey protocol guidelines. Develop data base, and data-input forms in coordination with other tribal/governmental entities.
- Task 3.3** Hire and train field technicians.
- Task 3.4** Analyze, interpret and summarize data, incorporate results into objectives 3, 4 and 5.
- Task 3.5** Conduct post – field season review for refinements and improvements for 2010 field season.
- Task 3.6** Annual reports summarize and report on findings

Objective 4: Document biologic condition, migration behaviors and environmental cues that trigger migration for both adult and juvenile Pacific lamprey.

Work Element 157 Habitat surveys and abundance and distribution surveys

Rationale At this time, there is limited or no information concerning the biological condition of either adults or juvenile lamprey as they migrate into or out of YNCL subbasins. Establishing this base line information will be important as we continue to track population health and trends over time.

Approach Specific protocols have not yet been developed to address aspects of this objective. Radio tags will likely be employed to track adult migration and behaviors through spawning. Fish will likely be caught and tagged at Mid-Columbia Public Utility dams using lamprey traps in Project fishways. Adults will be inspected and measured periodically throughout their migration to correlate, if possible, physical condition and spawning success.

Consistent with Objective 3, juveniles within habitat index sites will be captured, observed and measured for age analysis and note biologic characteristics. From this we hope to describe age structure characteristics and eventually correlate this information with reproductive success and changes in productivity. Other habitat attributes observed will also be measured (e.g., temperatures, stream gradients, sinuosity, land use, site conditions, visibility, % substrate cover estimates/vegetation, etc.) water quality related to primary production and habitat/substrate quality and quantity. In addition, salmonid smolt traps will also be used to collect, enumerate and measure biological characteristics of migrating juvenile lamprey.

Methods Specific methods to track, survey and enumerate juvenile and adult Pacific lamprey have been described in past documents produced by the Umatilla and Warm Springs Tribes through BPA funding (Tables 2 and 3 above). The Yakama Nation intends to use these protocols as guidance and refine as appropriate. Implementation of work specifically related to this objective will likely be initiated in year 2010 allowing time for planning and coordination with other regional fish managers and entities.

- Task 4.1** Work with other local and regional entities to identify appropriate field forms to enumerate and describe lamprey physical condition captured at salmonid smolt traps.
- Task 4.2** Coordinate with other tribal and local fishery managers to develop multi-year adult trapping, tagging and tracking plan for selected subbasins within the YNCLs.
- Task 4.3** Coordinate with other tribal and regional fishery managers to develop a sampling procedure to obtain and summarize Pacific lamprey genetic information within the YNCLs.
- Task 4.4** Identify environmental attributes that are considered to be important to lamprey population health and behaviors and describe the methods employed to measure these attributes.
- Task 4.5** Investigate the potential of juvenile pheromones (bile acids) as an adult migration attractant in tributary streams.

Objective 5: Identify habitat characteristics that are preferred at various life stages and determine the extent these habitats are available and are being utilized by Pacific lamprey.

Work Element 157 Habitat surveys and abundance and distribution surveys

Rationale As noted elsewhere, there is very little information available within the YNCLs that describes Pacific lamprey abundance or correlates presence/absence with habitat conditions. Low summer stream flow, excessive winter/spring runoff, extreme summer water temperatures, low available nutrients and availability of suitable habitat conditions are likely

key environmental attributes that affect lamprey productivity within YNCLs streams. Identifying habitats that are currently being used, identifying potentially good habitats that are not presently being used and identifying potential habitat that is currently altered or degraded but could be restored are important baseline features for developing future lamprey management objectives and strategies.

Approach Consistent with information collected under Objectives 3 and 4, information pertaining to habitat attributes for each index site throughout the YNCLs will be collected using a consistent and standardized protocol. Juvenile lamprey presence/absence and relative abundance will be correlated with this information to identify common attributes associated with relatively high (and low) lamprey abundance. Provided that funding is available, adults will be radio tagged and tracked and areas used for holding and spawning will be noted and specific habitat attributes measured.

Methods Specific field and analytical methods to address Objective 5 have not yet been described. Initial methodology will be developed in close coordination with other Tribal and regional fishery managers and will be piloted in 2009. Habitat attributes likely to be measured are general riparian characteristics, stream-habitat type, habitat complexity, water depth and velocity, substrate composition, seasonal water temperature, DO, pH, and conductivity. Population assessments of abundance information may eventually allow the use of mathematical models to predict future trends relative to management action plans.

- Task 5.1** Coordinate with Tribal and regional fishery managers to identify habitat attributes to be measured, protocols for measurement and analytical procedures.
- Task 5.2** Consistent with Objective 3, identify sampling strategy for juvenile lamprey presence and relative abundance and identify streams and areas to be sampled.
- Task 5.3** Conduct field surveys and data collection.
- Task 5.4** Data compilation, analysis and interpretation.
- Task 5.5** Summarize results for fishery co-manager review
- Task 5.6** Refine procedures for 2010 field season.

Objective 6: Identify and inventory all known and potential limiting factors existing in tributary habitats that threaten productivity of Pacific lamprey. Develop and implement a Pacific Lamprey Action Plan for the following subbasins: Methow, Entiat, Wenatchee, Crab Creek, Yakima, Rock Creek, Klickitat, White Salmon, Wind, and Little White Salmon (including smaller tributary streams to the Columbia River within the YNCLs).

Work Element 157 Habitat surveys and abundance and distribution surveys

Rationale At this time, there are no inventories of existing or potential limiting factors within the YNCLs specific to Pacific lamprey. The 2004 subbasin planning process identified general problems thought to impact Pacific lamprey but in most cases these were speculative and supported with very little information. Because there is a considerable lack of resources for lamprey habitat protection and restoration, there is a critical need to identify potential actions so that implementation may be prioritized, responsible entities identified and budgets established. In May, 2008 the CRITFC Tribes submitted a Draft Pacific Lamprey Tribal Recovery Plan (expected to be finalized in spring, 2009). This Plan addressed recovery needs at the regional level. The recovery plan envisioned under this Objective 6 will be consistent

with the CRITFC Plan but will provide specific information concerning subbasin habitats and limiting factors unique to those areas.

Approach Identification of known and potential limiting factors will require substantial collaboration with local fishery and resource managers. This effort is intended to commence in 2010, initially focusing on the Klickitat, Yakima, Entiat and Wenatchee Subbasins. A draft limiting factors report and prioritized implementation strategy for all subbasins included in this Scope of Work is intended to be completed by 2012. Initial efforts will involve meetings with resource professionals to inventory known or potential limiting factors within each subbasin. Once initial inventories have been compiled, field surveys will follow. Primary limiting factors that will be investigated are potential problems associated with irrigation dams and diversions, areas where habitat is known to have been degraded, areas known or potentially contaminated with toxic materials, late summer water temperatures, or areas where water chemistry (DO or pH) is likely to limit juvenile productivity. Other potential areas and attributes are expected to be identified as this process proceeds.

Methods Specific habitat characteristics similar to those affecting the decline of anadromous salmonids will be measured at each index site, and in areas where known or potential limiting factors have been identified. From this we can gain a better understanding of current habitat suitability and identification of critical habitat enhancement needs. Through meetings and field surveys we intend to develop a detailed and comprehensive inventory of potential or known limiting factors. Consistent with the development of implementation strategies contained in the Upper Columbia and Yakima Basin salmon recovery plans, we will prioritize actions based upon need and feasibility.

Passage barriers

YNPLP will work closely with the Washington Department of Fish and Wildlife, Bureau of Reclamation, USFWS and local governments to map culvert locations within YNCL subbasins. Lamprey presence information will be correlated with culvert location and condition to determine if passage is potentially impaired and if suitable spawning and rearing habitat is not being utilized.

Screening barriers

Methods used during larval lamprey surveys will be employed to determine if lamprey are present in irrigation ditches. Abundance, age-classes and distribution within the diversion will be noted. A GIS map will be produced identifying lamprey presence and distribution within irrigation diversions.

Stream flow and temperatures

YNPLP will work with CTWSRO, USGS, and USFWS on stream flow and temperature data information, and will be compared with distribution surveys to determine relationships between presence and age structure. This information will also be compared with published literature about life history needs (e.g., egg development, hatch timing) to determine if temperature is a limiting factor. If relationships are found it will allow us to identify potentially suitable habitat which is currently un-occupied, and work towards re-establishment of lamprey in that area. Where temperature information is not available continuously recording thermographs will be placed and temperatures will be monitored year around to assist in describing temperatures within all potential lamprey habitats.

- Task 6.1** Establish GIS spatial database to store locations and other relevant information pertaining to potential limiting factors throughout the YNCLs.
- Task 6.2** Initiate field surveys consistent to Objectives 3, 4, and 5.
- Task 6.3** Initiate meetings to gather and inventory potential or known limiting factors for each of the subbasins within the YNCLs.
- Task 6.4** Implement field reviews to characterize potential or known limiting factors and develop preliminary strategies to remedy these issues.
- Task 6.5** Consolidate and document information concerning identified limiting factors and prioritize and develop an Implementation Strategy to mitigate or remove limiting factors.

Objective 7: To increase larval abundance in tributary streams, implement a pilot adult Pacific lamprey translocation program from main-stem Columbia River hydro-electric projects into various subbasins (to be determined) and evaluate methodology and potential biological benefits and risks of expanding this program as appropriate.

Work Element: Undefined at this time

Rationale As previously noted, subbasins within the mid and upper Columbia River have exceedingly low populations of Pacific lamprey, presumably as a result of problems passing hydro-electric projects as well as other environmental factors. Until main-stem Columbia River passage is substantially improved it is unlikely that significant adult returns to upper subbasins will provide for reproduction to occur in many of these streams, as is evident from upper Columbia mainstem adult counts. Translocating adults into various subbasins and watersheds that have been captured from the mainstem Columbia River is not the most desirable management tool, but it may be necessary. Translocation is a means of re-establishing lamprey populations where they are lacking and its application is currently being considered by the Yakama Nation in consultation with other Tribal and regional fisheries managers. If employed, translocating fish is not intended to be implemented over a long-term.

Approach At this time, CRITFC tribal representatives are engaged in determining a comprehensive approach to translocate Pacific lamprey within various subbasins of the Columbia and Snake River systems. This approach will be described in the Final CRITFC Pacific Lamprey Tribal Recovery Plan. The Tribes are aware of 1) issues associated with genetics, 2) issues associated with taking fish from lower systems and placing them in upper river systems and 3) issues associated with placing adults in watersheds that may not have addressed other critical limiting factors. We are carefully weighing these considerations against the urgency of rapidly diminishing numbers. As the Yakama Nation continues progress in the development of a potential translocation program we anticipate adhering to the following guidelines: 1) translocation activities will be described annually and will be in cooperation with the Columbia River Inter Tribal Fish Commission, 2) a conservative number (rather than maximum) of fish will be used to meet annual program objectives, 3) a well-stated monitoring strategy will be included in annual program activities, and 4) all information collected from these efforts will be available for review.

Methods At this time the Umatilla and Nez Perce Tribes are currently translocating a relatively low number of Pacific lampreys into the Umatilla and upper Snake River subbasins.

The Yakama Nation has not yet translocated any fish. Throughout the first year of the YNPLP we intend to explore the potential and application of this management tool. When the Yakama Nation concludes that translocation is warranted, we will provide the BPA, ISRP and other regional fish manager's detailed plans in a timely fashion associated with take, care and keeping, release and monitoring.

- Task 7.1** Continue literature reviews and strategy development on lamprey capture, holding, transport, release and monitoring framework.
- Task 7.2** Continue working with CRITFC Tribes in the development of Columbia Basin comprehensive strategy to translocate fish, as needed.
- Task 7.3** Continue to inform and get input from Yakama Nation Tribal Council concerning translocation policy and guidelines.
- Task 7.4** Continue to evaluate potential facilities for holding Pacific lamprey for either short or longer timeframes.

Objective 8: Evaluate the potential and participate in the development of supplementation with artificial propagation techniques of Pacific lampreys

Work Element: Undefined at this time

Rationale The goal of the YNPLP is to restore natural populations of lamprey through improving habitat function and improvement of survival and passage through the FCRPS and other obstructions to migration. Understanding the potentially high costs and challenges associated with this goal, it is possible that re-establishing or supplementation of runs in certain subbasins using artificial production may be required if additional extirpations are to be avoided. Pacific lampreys are highly fecund and it has been demonstrated by the Umatilla Tribes and others that fertilization and rearing to early life stages ammocoete/larvae is relatively easy and inexpensive. There are many existing hatchery facilities and potential habitats where experiments in rearing larval fish to later age-classes would also be relatively easy, cost-effective and would provide valuable insights into juvenile development and environmental needs of this fish. And, if existing speculation about the instincts of adults to home on juvenile bile acids (pheromones) is correct, out-planting of juveniles may become an invaluable management tool to enhance or re-establish adult spawning in areas currently devoid of productivity at this time.

Approach The Yakama Nation will work with other CRITFC tribes and regional fishery managers to develop laboratory, field techniques and appropriate management applications for artificial propagation and will develop an associated monitoring strategy when it has been determined by fisheries managers that such an approach is necessary.

Methods When the Yakama Nation concludes that artificial propagation and outplanting of juveniles is warranted, we will provide the BPA, ISRP and other regional fish managers detailed plans in a timely fashion.

- Task 8.1** Continue literature reviews and strategy development on lamprey capture, holding, transport, release and monitoring framework.

- Task 8.2** Continue working with CRITFC Tribes in the development of Columbia Basin comprehensive strategy to artificially propagate fish, as needed.
- Task 8.3** Continue to inform and get input from Yakama Nation Tribal Council concerning artificial propagation policy and guidelines.
- Task 8.4** Continue to evaluate potential facilities for holding Pacific lamprey for either short or longer timeframes.

(G). Monitoring and evaluation

The YNPLP will focus on the larval, juvenile and adult lamprey populations. This statement of work was designed to combine, evaluate and make inferences from data collected as stated from the above from 2009 – 2017. Research actions range from the historical, empirical and scientific data collected and new work proposed from the objectives of ongoing work from Columbia River Basin tribes, federal, state and local government agencies and NGOs. The actions for juvenile monitoring are integrated in Objectives 1, 2, 3 and 4. Additional information may come from existing rotary screw trap data from WDFW, USFWS, and YN fisheries departments to capture when juvenile lamprey are migrating. From these data we can investigate their distribution and timing. These set together provide essential information to illustrate lamprey inhabiting the YNCLs subbasins.

(H). Facilities and equipment

In order to meet project goals, we anticipate that all of the work for this project will be conducted out of the Yakama Nation main office in Toppenish, WA. And field offices from Goldendale, Peshastin and Winthrop, WA. Offices will be supplied with modern equipment, computers, and analysis software necessary to complete activities associated with the Yakama Nation Pacific Lamprey Program.

(I). References

- Anglin, D.R. W.J. Ambrogetti, and CL Burley. 1979. A preliminary study to determine feasible methods of harvesting adult lamprey in the Columbia River. U.S. Fish and Wildlife Service, Vancouver, Washington. 23 pp.
- Beamish, R. J. 1980. Adult biology of the river lamprey (*Lampetra ayresi*) and the Pacific lamprey (*Lampetra tridentata*) from the Pacific coast of Canada. Canadian Journal of Fisheries and Aquatic Sciences. 37: 1906-1923.
- Beamish, R.J. and T.G. Northcote. 1989. Extinction of a population of anadromous parasitic lamprey *Lampetra tridentate* upstream of an impassable dam. Canadian Journal of Fisheries and Aquatic Sciences 46:420-425.
- Beamish, R. J. and C. D. Levings. 1991. Abundance and freshwater migration of the anadromous parasitic lamprey, *Lampetra tridentata*, in a tributary of the Fraser River, British Columbia. Canadian Journal of Fisheries and Aquatic Sciences. 48:1250-1263.
- Claire, C.W. 2004. Pacific lamprey larvae life history, habitat utilization and distribution in the South Fork Clearwater River drainage, Idaho. MS Thesis. Department of Fish and Wildlife. University of Idaho. Moscow, Idaho.
- Close, D.A., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. Status report of the Pacific lamprey (*Lampetra tridentata*) in the Columbia River Basin. Report (Contact No. 95BI39067) to Bonneville Power Administration, Portland, Oregon.
- Close, D. A. 2000. Pacific lamprey research and restoration project. 1998 Annual

- Report to Bonneville Power Administration, Contract No. 00000248-1, Project No. 199402600.
- Close, D.A., M.S. Fitzpatrick and H.W. Li. 2002. The ecological and cultural importance of a species at risk of extinction, Pacific Lamprey. Fisheries. Vol 27. No. 7. Pg. 19-25.
- Close, D.A. and A. Jackson. 2001. Pacific Lamprey research and restoration project. Annual Report 1999. Project Number 94-026. Contract No. 95BI39067 to Bonneville Power Administration. By Confederated Tribes of the Umatilla Indian Reservation. Department of Natural Resources. Pendleton, OR. 171 pages.
- Cochnauer, T. and C. Claire. 2001. Evaluate status of Pacific lamprey in the Clearwater River drainage, Idaho. Annual Report 2002. Prepared for BPA. Idaho Department of Fish and Game. Lewiston, Idaho.
- CRITFC. 2008. January 8, 2008 Comments on the draft 2008 Biological Opinion on the Operation of the Federal Columbia River Power System. Columbia River Inter-Tribal Fish Commission. Portland, Oregon.
- Cummings, D. 2007. Direct and Indirect Barriers to Migrations- Pacific lamprey at McNary and Ice Harbor Dams in the Columbia River Basin. MS Thesis. College of Natural Resources. University of Idaho. Moscow, Idaho.
- Cummings, D. , C. Peery and M. Moser. 2006. 2006 Evaluation of adult Pacific lamprey passage success at McNary and Ice Harbor dams. Abstract and presentation at Corps of Engineers Annual AFEP Review. Portland, Oregon.
- Jackson, A.D., P.D. Kissner, D.R. Hatch, B.L. Parker, D.A. Close, M.S. Fitzpatrick, and H. Li. 1996. Pacific lamprey Research and Restoration. Report (Project Number 94-026) to Bonneville Power Administration, Portland, Oregon.
- Jackson, A.D., D.R. Hatch, B.L. Parker, D.A. Close, M.S. Fitzpatrick, and H. Li. 1997. Pacific lamprey Research and Restoration. Report (Project Number 94-026) to Bonneville Power Administration, Portland, Oregon.
- Johnson, E, C. Peery and M. Moser. 2007. Effects of reduced nighttime entrance velocities on lamprey entrance use at Bonneville Dam. Abstract and presentation at Corps of Engineers Annual AFEP Research Review. December 3-7, 2007. Walla Walla, Washington.
- Kan T. T. 1975. Systematics, variation, distribution, and biology of lampreys of the genus *Lampetra* in Oregon. PhD. Dissertation, Oregon State University, Corvallis, Oregon.
- Meeuwig, M. H., J. M. Bayer, and J. G. Seelye. 2005. Effects of temperature on survival and development of early lifestage Pacific and western brook lampreys. Transactions of the American Fisheries Society, 134: 19-27.
- Ocker, P. A., L. C. Stuehrenberg, M. L. Moser, A. L. Matter, J. J. Vella, B. P. Sandford, T. C. Bjornn, and K. R. Tolotti. 2001. Monitoring adult Pacific lamprey (*Lampetra tridentata*) migration behavior in the lower Columbia River using radiotelemetry, 1998-99. Report to U.S. Army Corps of Engineers, Portland District, Portland, Oregon.
- Pletcher, F. T. 1963. The life history and distribution of lampreys in the Salmon and certain other rivers in British Columbia, Canada. Master's thesis. University of British Columbia, Vancouver.
- Richards J.E., Beamish R.J. & Beamish F.W.H. (1982) Descriptions and keys for ammocoetes of lamprey from British Columbia, Canada. Canadian Journal of Fisheries and Aquatic Sciences, 39, 1484–1495.

Torgerson, C.E. and D.A. Close. 2001. Habitat heterogeneity and the spatial distribution of larval Pacific Lamprey (*Lampetra tridentata*) in an Oregon stream. Bonneville Power Administration Project 94-026, Portland, Oregon.

Weisser J.W. & Klar G.T. (1990) Electric fishing for sea lampreys (*Petromyzon marinus*) in the Great Lakes region of North America. In: Developments in Electric Fishing (Ed. I.G. Cowx), pp. 59–64. Cambridge University Press, Cambridge, U.K.

(J). Key personnel Patrick L. Luke

Present Position: Yakama Nation Pacific Lamprey Project Biologist
P. O. Box. 314 / 708 N. Franklin Street
Goldendale, Washington 98620
Work: 509-772-2777
Cell: 509-261-9028
Email: pluke@ykfp.org

EDUCATION & TRAINING

Oregon State University (OSU), Corvallis, Oregon

Major: Fisheries and Wildlife Science Bachelors Degree Awarded: June 2007

Blue Mountain Community College, Pendleton, Oregon

Major: Biology/Associate of Arts Oregon Transfer Degree Awarded: June 2003

RESEARCH/WORK EXPERIENCE

OSU, Fisheries & Wildlife & Oceanography Departments (Dept.), June 2007. American shad (*Alosa sapidissima*) in the Pacific Northwest: contrast with parent stocks from the East Coast USA.

OSU, Hatfield Marine Science Center (HMSC) June-December 2006. Temporal patterns of late stage recruitment of larval ghost shrimp (*Neoptypaea californiensis*) in Yaquina Estuary using a standard and continuous sampling system.

OSU, HMSC, National Science Foundation, Research Experience for Undergraduates, June-August 2006: Temporal patterns of larval ghost shrimp (*Neotryaea californiensis*) in Yaquina Estuary using a continuous plankton sampling system.

CRITFC, June – June 2003-2005 SURVEY FOR PRESENCE OF THE INVASIVE SPECIES (*Potamopygus antipodarum*), IN THE UMATILLA, WALLA WALLA, JOHN DAY, AND GRAND RONDE RIVER SYSTEMS.

OSU Graduate Students Research Assistant, Department of Fisheries and Wildlife, Sept.-June 2004-2007 funded by the Native American in Marine & Space Science (NAMSS) Responses of a Threatened Cutthroat Trout to an Exotic Invading Charr: Ecological Implications for Growth, Stress, and Behavior, Corvallis, Oregon

OSU Laboratory technician, College of Atmospheric & Oceanography Science Dept., Sept.-June 2005-2007 funded under NAMSS program, Corvallis, Oregon

CRITFC Fisheries Technician Intern, June 2003 – June 2005 - Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Department of Fish & Wildlife, Pendleton, Oregon

CRITFC Fisheries Technician Intern August 2004 – September 2005 - Yakama Nation Fisheries Department, Lower Columbia River Zone 6 Fisheries-Lyle, White Salmon, Bingen, Cooks, Washington
CTUIR Fisheries Technician, June – December 1987, Department of Fish & Wildlife, Pendleton, Oregon

WORK EXPERIENCE

Yakama Nation Fisheries Resource Management Program August 2008 – present
Construct Yakama Nation Pacific Lamprey Program plan, organize scope of work and budget to restore Pacific Lamprey (*Lampetra tridentata*) within the Ceded Lands of the Confederated Tribes & Bands of the Yakama Nation. Administer BPA contract, coordinate with basin managers, provide logistical support, assist with data analysis and take the lead for project reporting. Assess status, review historical distribution and abundance, understand biology, ecology, limiting factors, habitat utilization, and develop restoration plans. Provide tribal policy representatives with information and recommendations for policy decisions regarding all aspects of Pacific lamprey management on and off Reservation, YNCLs, Usual and Accustomed fishing areas.

Yakama Klickitat Fish Project June 2007 – August 2008
Klickitat Salmon Hatchery/Passage Biologist, responsible for understanding Klickitat Master Plans, salmon hatchery production protocols. Collection of adults Chinook (*Oncorhynchus tshawytscha*) and Coho (*Oncorhynchus kisutch*) Salmon, understand fish physiology, metabolisms, immune systems (diseases), and growth projections of hatchery fishes, feed sheets, and pathology. Daily computer use to write reports used various spreadsheets to keep records and data organization. In charge of daily tasks and pulling biweekly standby duties, water alarms of the entire hatchery system, maintenance of facility, vehicles, snowmobile, all terrain quad runner, and running tractor feeder.

Commercial Fisherman January 1989- May 2000
Crabber, Longliner, Salmon/Herring Purse Seiner, West & East Aleutian Islands, Pribolif Islands, The Bering Sea of Alaska, Kodiak Island, Gulf of Alaska, Southeast Alaska, and Northeastern Pacific Ocean, Puget Sound, Washington
US Forestry Service (summers) May 1985-October 1988
United State Marine Corp (Marine Barracks Duty) June 1981- June 1984
Beirut, Lebanon Era

Technicians III's to be hired March 2009