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

Narrative

Table 1. Proposal Metadata

Project Number	2008-455-00	
Proposer	Yakama Confederated Tribes (Prime – YAKINDN00	
Short Description	Sturgeon Management	
Province(s)	Columbia Cascade	
Subbasin(s)	Columbia Upper Middle	
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Information transfer:

A. Abstract

The long-term goal of the Yakama Sturgeon Management Project (2008-455-00) described in this narrative is to facilitate restoration of viable populations and fisheries for white sturgeon in mid-Columbia River reservoirs. Phase I (2009-2010) of the Yakama Sturgeon Management Project (2008-455-00) will accomplish the following:

1. Assist in the development of a recovery, research and monitoring strategy, and hatchery Master Plan for depleted sturgeon populations in FCRPS portions of the mid-Columbia (below Priest Rapids Hydroelectric Project) and lower Snake rivers.
2. Continue to develop critical expertise and refine effective sturgeon culture methodology for spawning and rearing of white sturgeon using tribal staff, facilities and resources, and captive broodstock currently maintained on the Yakama Reservation at the Prosser and Marion Drain Hatcheries.
3. Identify facility and staff requirements and costs of hatchery alternatives for use in research/monitoring and hatchery Master Plan considerations (based on #2 and #3 above).
4. Develop a detailed implementation plan for production and rearing of juvenile sturgeon as appropriate for use in experimental research and hatchery feasibility evaluations (as identified in #1 above).
5. Assist in the development and implementation of effective experimental research and hatchery feasibility evaluations (as identified in #1 above).

This work complements other ongoing sturgeon research and restoration efforts and directly addresses the objective of the 2004 NPCC Subbasin Plan to increase sturgeon abundance in the lower mid-Columbia mainstem by: 1) continuing to develop hatchery technology and methodologies, 2) evaluating the need for hatchery supplementation. Over 20 years of dedicated research and management has failed to date to restore natural productivity or opportunities for harvest of mid-Columbia River sturgeon impacted by the hydropower system. Policy choices make it clear that future sturgeon restoration efforts will involve some use of hatchery sturgeon either as experimental subjects for research of limiting factors or for supplementation of unproductive natural populations upstream from Bonneville Dam. Hatchery measures including

experimental applications and supplementation are being developed in a comprehensive strategic and Master Plan effort initiated under the MOA by the Columbia River Inter-Tribal Fish Commission (Project 2007-155-00). The YN project does not propose building new hatchery facilities or releasing hatchery-reared sturgeon during Phase I. Phase I identifies hatchery evaluation and development work to be completed concurrent with CRITFC comprehensive strategic and hatchery master planning which will clarify appropriate applications and objectives for hatchery sturgeon in the lower mid-Columbia River (downstream from Priest Rapids). Phase II work of the YN project will depend on the outcomes of the CRITFC strategic and master planning effort and YN Phase I results. YN Phase I involves a short term contract with the Bonneville Power Administration and does not include the development of significant new facilities. YN Phase II might include significant new facilities contingent on the outcome of the strategic and master planning process. Work will be completed by Yakama Tribal fishery program staff in coordination with fishery co-managers from other treaty tribes and the states. Hatchery activities will occur primarily at established Tribal Facilities at Prosser and Marion Drain Hatcheries, and may involve limited temporary modifications.

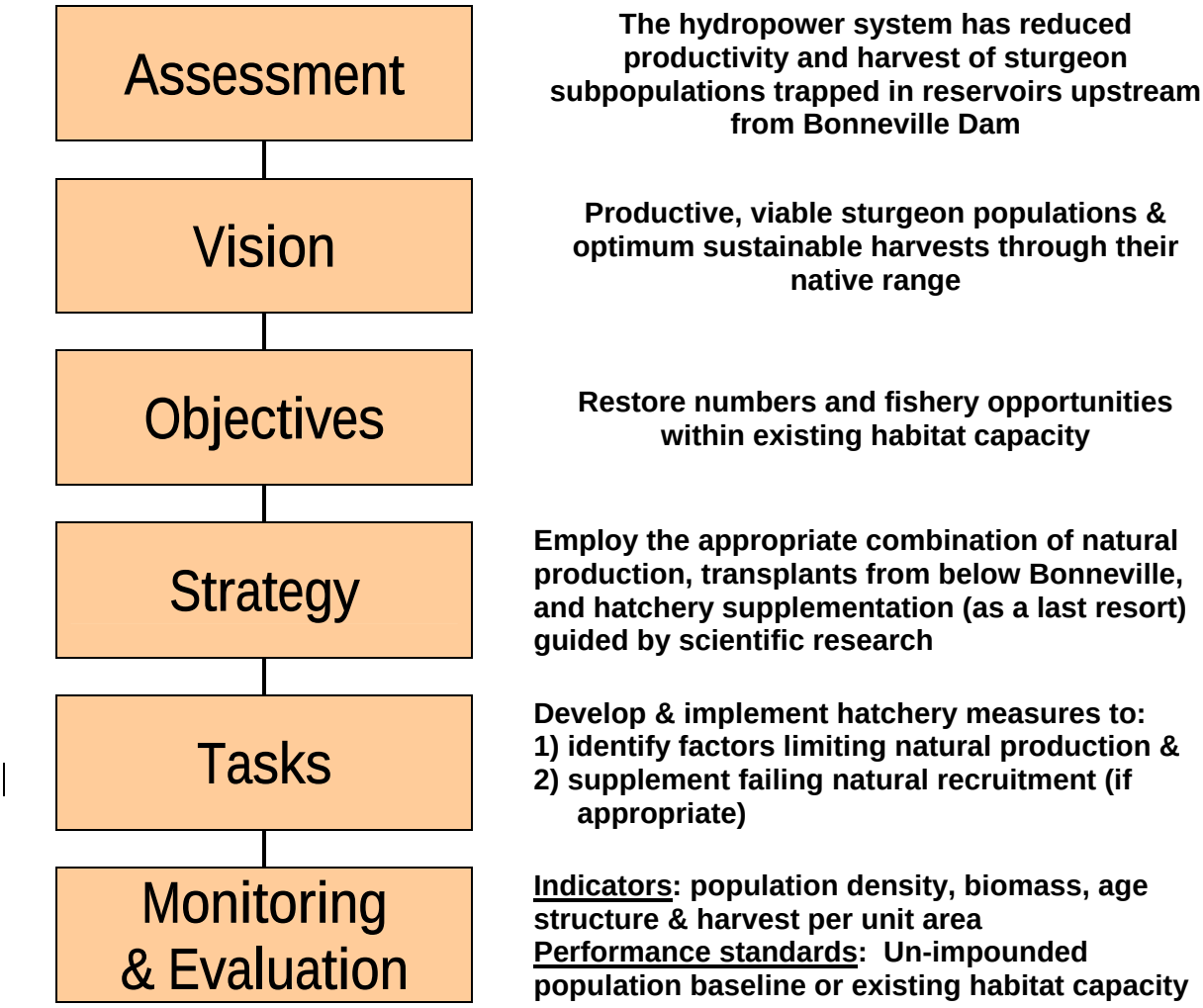

Figure 1. Logic path for the Yakama sturgeon management project within the context of regional sturgeon conservation, management, and restoration efforts.

B. Problem statement: technical and/or scientific background

Construction and operation of the hydropower system has drastically reduced the biological viability and harvest opportunity for white sturgeon throughout the Columbia and Snake river systems (Beamesderfer et al. 1995; UCWSRI 2002; NPCC 2004). Dams block passage of white sturgeon and trap resident subpopulations in a series of mainstem reservoirs which do not include conditions optimal for all life stages (North et al. 1993; Warren and Beckman 1993; Beamesderfer et al. 1995; Parsley et al. 2007). Production has been reduced or eliminated from large areas of the system (Figure 2). Harvest opportunities have been severely limited in tribal subsistence and commercial fisheries and non-tribal recreational fisheries upstream from Bonneville Dam (Figure 3). The impact has been particularly onerous on tribal fisheries which do not currently have access to the large anadromous sturgeon population downstream from Bonneville Dam. Existing opportunities for Tribal fisheries outside the Columbia River Zone 6 (Bonneville to McNary dams) do not provide significant access to sturgeon harvest.

Most impounded populations are recruitment-limited due to a lack of suitable spawning habitat or flow conditions to produce significant recruitment in the available habitat (Parsley and Beckman 1994; Counihan et al. 1999; Parsley and Kappenman 2000; NPCC 2004). Impoundments provide large areas of habitat suitable for juvenile, subadult, and adult sturgeon (Parsley et al. 1993; Parsley and Beckman 1994). Stock assessments of impounded populations have found good survival, growth, and condition of resident sturgeon (Beamesderfer et al. 1995; Rien 2007; Mallette 2008). This information suggests that the available habitat for juveniles and adults is not currently being utilized to capacity and could support greater sturgeon numbers if recruitment and passage were not limiting.

Over 20 years of dedicated research and management has failed to restore significant levels of natural recruitment or opportunities for harvest for mid-Columbia sturgeon (NPCC 2004; Mallette 2008; ODFW and WDFW 2008). Initial restoration efforts in Bonneville, The Dalles, and John Day reservoirs emphasized: 1) transplants of juveniles from below Bonneville as an alternative to reengineering of dam passage facilities, 2) continuing evaluations of flow-recruitment relationships to identify critical thresholds and potentially beneficial water management measures, and 3) intensive fishery management in order to optimize harvest of existing populations at sustainable levels (NPCC 2004; Rien 2007; Mallette 2008).

High survival rates of fish transplanted into The Dalles and John Day reservoirs were promising (Rien and North 2002) but the program was suspended after 2005 due to funding constraints, difficulties in capturing adequate numbers of fish below Bonneville and concerns for impacts on the unimpounded population (Rien 2007). Concern over impacts on salmon has been a significant impediment to the consideration of potential passage and flow measures for sturgeon. No flow measures have been implemented to date for the specific benefit of impounded sturgeon populations in the mid-Columbia and lower Snake. Nor has consistent recruitment of sturgeon been restored by flow or other operational measures implemented for salmon (Mallette 2008). Impounded populations remain at low or very low levels and in areas upstream from McNary Dam have been reduced to the point of nonviability (Ward 1999, 2000; Golder Associates 2003a, 2003b; Mallette 2008). Fishing opportunities on impounded populations remain very limited and continue to decline (Figure 3).

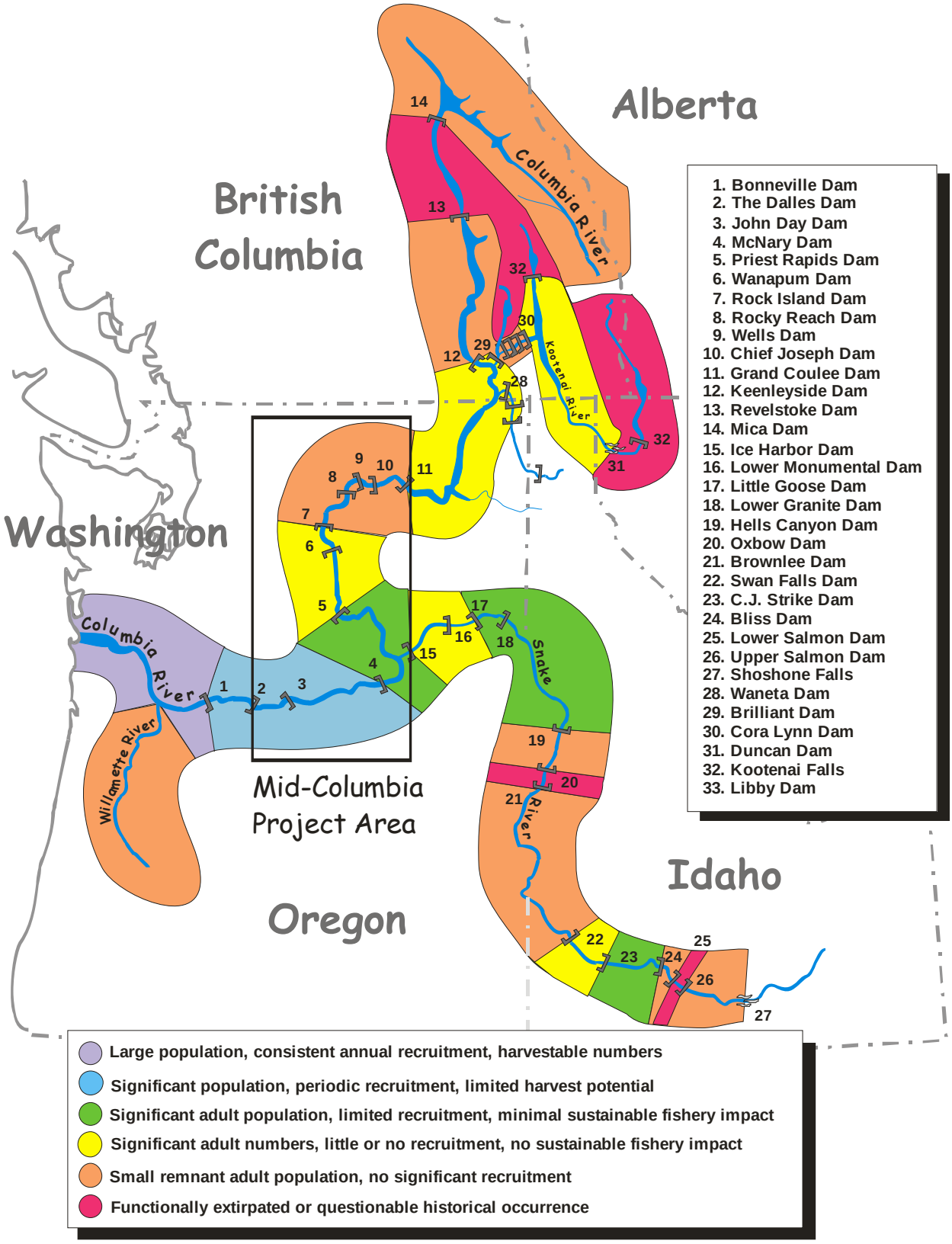

Figure 2. **Status of white sturgeon subpopulations throughout the Columbia and Snake river system (adapted from UCWSRI 2002).**

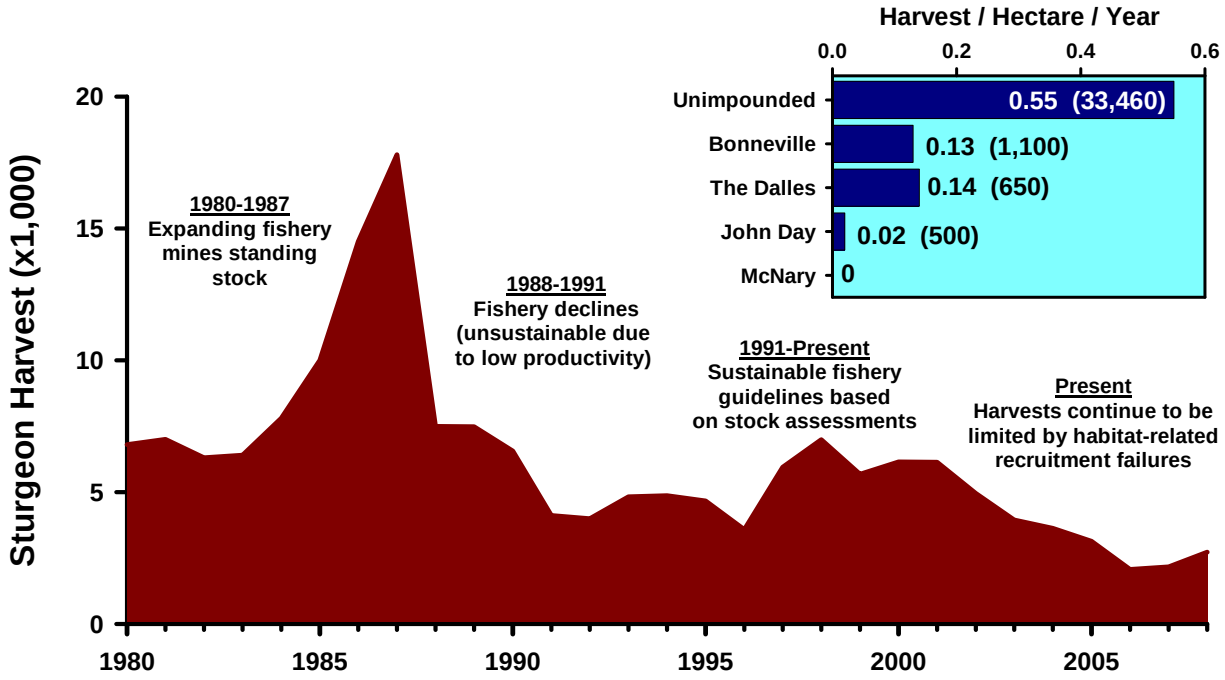

Figure 3. Annual harvest of white sturgeon from mid-Columbia impoundments upstream from Bonneville Dam and relative productivity based on 2008 harvest guidelines which are derived from sustainable harvest rates at current population levels (data from NPCC 2004; ODFW & WDFW 2008; Mallette 2008).

Hatchery supplementation has been identified as one potential alternative for restoration of depleted sturgeon populations and fisheries in the mid-Columbia Reservoirs (NPCC 2004). Supplementation is a viable alternative for sturgeon restoration in the absence of effective implementation of other beneficial measures including spawning flow increases, passage improvements, or transplants (Beamesderfer and Farr 1997; Munro et al. 2007). Effective hatchery methods have only relatively recently been adapted and applied to North America sturgeons (Conte et al. 1988; Munro et al. 2007). Successful conservation hatchery programs have been developed for unique headwater populations of white sturgeon to bridge chronic habitat-related recruitment failures in the Kootenai River (Duke et al. 1999; Ireland et al. 2002a, 2002b; Paragamian and Beamesderfer 2004; Paragamian et al. 2005; KTOI 2007) and the transboundary upper Columbia River (Hildebrand et al. 1999; UCWSRI 2002; NRTWS 2006; Irvine et al. 2007). Kootenai and upper Columbia sturgeon recovery programs have demonstrated the feasibility of using hatchery-spawned sturgeon from wild parents to preserve native genetic diversity, supplement failed natural recruitment, and increase abundance in certain situations.

Hatchery-produced sturgeon are also a very useful experimental tool for applied research to determine limiting factors, habitat capacity, broodstock limitations, population parameters, and immigration/entrainment in natural populations (Box 1). Monitoring of hatchery sturgeon released in the Kootenai and Upper Columbia has provided critical information on factors limiting natural production, system capacity, and life history bottlenecks (Ireland et al. 2002b; Golder 2007; Justice et al. 2009). Under current conditions of low recruitment, critical information often cannot be obtained by monitoring of natural populations alone because of low numbers and sampling power. Use of marked hatchery fish provides a known subject population and structured releases allow for the design of systematic statistical experiments

Box 1. Potential test hypothesis that can be effectively addressed by research and monitoring using experimental releases of juvenile sturgeon spawned and reared in a hatchery.

H1: Existing reservoir habitat is suitable for feeding, growth, survival and maturation of juvenile and subadult sturgeon.

H2: Juvenile and subadult sturgeon utilize a wide range of the available reservoir habitats.

H3: Habitat capacity of each reservoir is sufficient to support significant numbers and biomass.

H4: Density dependent habitat constraints do not significantly affect population productivity.

H5: Natural recruitment can be effectively estimated based on marked-unmarked ratios and recaptures of marked hatchery fish.

H6: Habitat bottlenecks that currently limit recruitment occur at the spawning and/or early life history stages.

H7: Downstream passage/entrainment does not significantly affect abundance and survival in source and downstream populations.

H8: Behavior, distribution, movements, growth, survival, and condition of hatchery and wild fish is similar.

H9: Hatchery supplementation can significantly increase harvestable numbers in reservoir populations.

H10: Hatchery supplementation is a cost effective alternative for increasing harvestable numbers in reservoir populations.

H11: Size and time of release determines the potential effectiveness and cost of hatchery supplementation.

H12: Survival, growth, emigration and production capacity is reservoir specific and optimum hatchery supplementation levels are effectively estimated based on monitoring of population performance relative to fish number.

H13: Natural recruitment in specific reservoirs is limited by low numbers of adult spawners.

H14: Supplemented populations can be harvested with protection and recruitment of adults adequate to provide significant natural recruitment when suitable conditions occur.

H15: Hatchery supplementation of impounded populations does not reduce genetic and life history diversity in target or adjacent populations through artificial selection or domestication.

H16: Hatchery supplementation of impounded populations can occur without significant impact to the unimpounded anadromous population downstream from Bonneville Dam.

While successful programs in the Kootenai and transboundary upper Columbia upstream from Grand Coulee Dam have demonstrated that hatchery production of sturgeon for experimental and conservation applications is feasible, consistent success has proven to be difficult to achieve in the developmental phase of each programs. Both Kootenai and upper Columbia programs required several years of refinement in facilities, systems and expertise to overcome early problems (KTOI 2007; Ron Ek, Ft. Steele sturgeon hatchery manager, pers. comm.). Difficulties were highlighted by hatchery research efforts conducted from 1999 to 2003 by the Columbia River Inter-Tribal Fish Commission and the U. S. Fish and Wildlife Service under Phase II of the BPA-funded 1986-050-00 sturgeon project (Kappenman and Parker 2004). This research significantly advanced the technical basis for use of hatchery fish in mid-Columbia reservoirs by evaluating protocols for capture and maturation of adults, adapting culture and rearing technology, and evaluating release strategies. However, the program was limited by a series of problems obtaining adequate numbers of broodstock from depleted populations to ensure

synchronous spawning of males and females sexual maturation of adults collected prior to spawning, limitations of temporary facilities, and stress-related disease outbreaks Based on these efforts, Kappenman and Parker (2004) concluded that development of an effective sturgeon hatchery program will require: 1) significant multi-year investments, 2) the availability of both adequate facilities and sturgeon culture expertise, and 3) an adaptive approach to refinement of culture methods specific to the facility and application.
Considerations of the potential benefits of hatchery sturgeon must be tempered with careful calculation of the related conservation risks and costs (Anders 1998; Secor et al. 2002; Kappenman and Parker 2004). Benefits and risks of potential hatchery actions in the mid-Columbia and lower Snake rivers are being evaluated as part of a comprehensive strategic and master planning effort initiated under the MOA by the Columbia River Inter Tribal Fish Commission (Project 2007-155-00). That project will clarify the suitability and role of hatchery sturgeon, and develop detailed implementation plans for hatchery actions and evaluations as appropriate. However, it is clear that future sturgeon restoration efforts will involve some use of hatchery sturgeon including, at a minimum, as experimental subjects for evaluation of factors limiting restoration potential.

The Yakama Nation Fishery Program has been exploring sturgeon culture requirements by rearing small numbers of white sturgeon in tribal hatchery facilities since the 1990s. Fish were obtained from various sources including the private Pelfy sturgeon hatchery operating downstream from Bonneville Dam and mid-Columbia hatchery research by CRITFC and the USFWS (Kappenman and Parker 2004). The Yakama Nation hatchery program has successfully spawned captive broodstock in 2007 and 2008 and is currently rearing age 0+ and 1+ sturgeon. This work and expertise provides an opportunity to facilitate implementation of appropriate hatchery measures at such time as needs and objectives are clearly established under the concurrent comprehensive strategic and master planning effort for mid-Columbia sturgeon.

The long-term goal of the Yakama Sturgeon Management Project (2008-455-00) described in this narrative is to facilitate restoration of viable populations and fisheries for white sturgeon in mid-Columbia River reservoirs. Specific objectives to address near term needs in the first phase of this project include:

1. Assist in the development of a recovery, research and monitoring strategy, and hatchery Master Plan for depleted sturgeon populations in FCRPS portions of the mid-Columbia and lower Snake rivers (facilitated by the CRITFC).
2. Continue to develop critical expertise and refine effective sturgeon culture methodology for spawning and rearing of white sturgeon using tribal staff, facilities and resources, and captive broodstock currently maintained on the Yakama Reservation at the Prosser and Marion Drain Hatcheries.
3. Identify facility and staff requirements and costs of hatchery alternatives for use in research/monitoring and hatchery Master Plan considerations (based on #2 and #3 above).
4. Develop a detailed implementation plan for production and rearing of juvenile sturgeon as appropriate for use in experimental research and hatchery feasibility evaluations (as identified in #1 above).
5. Assist in the development and implementation of effective experimental research and hatchery feasibility evaluations (as identified in #1 above).

This work will be implemented in a collaborative manner with other regional and local fisheries managers and interests in Federal and non-Federal portions of the system to produce coordinated, complementary, and cost effective outcomes. In cooperation with the CRITFC, Yakama Tribal field staff have been assisting in sturgeon status assessments during ongoing sturgeon research, monitoring, and evaluation, that have been underway in the mid-Columbia since 1986 as part of BPA project 1986-050-00. Yakama fishery managers have also been closely involved with sturgeon management and restoration coordination activities of the Columbia River Sturgeon Management Task Force involving state and tribal fishery co-managers. This project will provide dedicated resources to enhance substantive participation and contributions as sturgeon efforts continue to transition from research to restoration activities. The resulting information and expertise will inform the overarching strategic and master planning efforts and expedite subsequent experimental implementation and evaluation of restoration actions.

C. Rationale and significance to regional programs

Columbia Basin Fish Accords

This project is consistent with objectives to deliver specific, scientifically valid biological results for the region's fish identified in the 2008 Fish Accord agreements signed by Northwest tribes and the Columbia River Inter Tribal Fish Commission with the federal action agencies.

2000 Fish and Wildlife Program

This project specifically addresses overarching biological objectives, resident fish substitution objectives and artificial production strategies identified by the 2000 Fish and Wildlife Program (NPCC 2000). Every Fish and Wildlife Program since 1984 has recognized the need for research to determine the impacts of development and operation of the hydroelectric power system on sturgeon and evaluations of the potential for artificial propagation of white sturgeon (NPPC 1984; NPCC 2000).

The 2000 NPCC program identifies four overarching biological objectives for the fish and wildlife program: 1) a diverse sustainable ecosystem, 2) mitigation for adverse effects of the hydrosystem, 3) sufficient opportunities for tribal trust, treaty right, and non-tribal harvest, and 4) recovery of ESA-listed species (NPPC 2000). The Yakama Nation Sturgeon Management Project will: 1) help sustain ecosystem diversity by restoring abundance and spatial structure of native white sturgeon in key portions of their range, 2) identify and provide an effective means of mitigating for adverse effects of the hydrosystem, and 3) improve opportunities for harvest of sturgeon, particularly including tribal trust and treaty rights.

For resident fish, objectives include 1) loss assessments, 2) protection and restoration of healthy ecosystems and watersheds, 3) an ecosystem approach to resident fish restoration, and 4) a 100-year target for full mitigation. The program also identifies additional objectives for blocked areas where resident fish substitutions are unable to mitigate for large anadromous losses. These include: restoration of resident fish abundance, reintroductions where feasible, and administration and improvement of fishery opportunities for native, wild and hatchery-reared stocks that are compatible with native resident species. Both resident and blocked-area objectives are pertinent to sturgeon in the mid-Columbia River reservoirs. Sturgeon were historically anadromous and provided a very large and important resource to tribal fisheries upstream from Bonneville Dam. However, anadromous sturgeon no longer pass Bonneville Dam and production of resident sturgeon is not adequate to offset the loss of access to anadromous sturgeon resources. Habitat protection and restoration efforts are not adequate to

restore significant production of resident sturgeon due to a lack of recruitment. Hatchery-reared stocks appear to be the only realistic alternative for meeting these objectives.

The 2000 NPCC Program directed that artificial production can be used, under proper conditions, to 1) complement habitat improvements by supplementing native populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas. The Yakama Nation Sturgeon Management Project is consistent with NPCC guidance in the development and implementation of an appropriate strategy for supplementing native populations within the carrying capacity of the habitat while also ensuring protection of the native wild populations.

2004 Subbasin Plan

This project explicitly addresses objectives and strategies identified for sturgeon in the 2004 NPCC Lower Mid-Columbia Mainstem Subbasin Plan. White sturgeon are selected as a focal species for this subbasin based on their management, ecological, and cultural significance. Objectives for white sturgeon include increasing abundance in the lower mid-Columbia mainstem (especially in reservoirs where the population is likely dying out). Corresponding strategies include: 1) continuing to develop hatchery technology and methodologies, 2) supplementing the sturgeon population in Priest Rapids Pool with hatchery fish, and 3) considering the use of hatchery fish to supplement The Dalles and John Day populations.

The subbasin plan noted that hatchery technology has progressed to the point where it may now be possible to supplement white sturgeon populations in the lower mid-Columbia:

> *In recent years the development of more successful hatchery technology has resulted in a growing commercial aquaculture industry in California and the potential for further commercial and enhancement hatcheries in the Columbia River Basin. (NPPC 2004)*

Only this project and the complementary sturgeon strategic and master planning project (2007-155-00) are currently in development to address sturgeon hatchery strategies identified for the FCRPS portion of the mid-Columbia River. No other sturgeon hatchery evaluation efforts are included in ongoing projects funded under the Fish and Wildlife Program for the mid-Columbia.

ESA

Neither lower or mid-Columbia sturgeon are currently listed under the Endangered Species Act. Hence, neither are specifically subject to Biological Opinions (BiOp), recovery plans, Habitat Conservation Plans, or other plans. The unique headwater population of Kootenai River white sturgeon was listed as endangered in 1994 in response to population declines caused by recruitment failure (Duke et al. 1999). Upper Columbia River white sturgeon in the Canadian portion of the transboundary population upstream from Grand Coulee Dam were listed under the Canadian Species at Risk Act in 2003 (Wood et al. 2007).

NMFS Biological Opinion

Columbia River white sturgeon are not considered in the 2008 FCRPS BiOp because they are not listed under the Endangered Species Act. Kootenai River sturgeon are listed but subject of a separate biological opinion for Libby Dam. Green sturgeon are addressed by the 2008 FCRPS BiOp but their Columbia River distribution is limited to the estuary. Green sturgeon originate outside the Columbia River system and do not occur in mid-Columbia River areas addressed by

this project. Actions affecting mainstem flow and habitat conditions identified in the BiOp for the benefit of listed salmonids have the potential to indirectly affect mid-Columbia River sturgeon but implemented or planned salmon alternatives have not and are not expected to significantly improve production of mid-Columbia River sturgeon populations.

Mid-Columbia Relicensing

This project is designed to address sturgeon management, conservation, and restoration in Federal Columbia River Power System (FCRPS) reservoirs of the mid-Columbia River between Bonneville and Grand Coulee dams.

Sturgeon mitigation issues in upper mid-Columbia River reservoirs operated by the Public Utility Districts (PUDs) fall under the purview of FERC license requirements of Grant County PUD (Priest Rapids, Wanapum), Chelan County PUD (Rock Island, Rocky Reach), and Douglas County PUD (Wells).

The Yakama Nation is independently involved in discussions with the PUD's regarding objectives, opportunities, and alternatives for sturgeon mitigation in PUD project areas. FCRPS sturgeon restoration and monitoring efforts can provide a useful template and expertise for effective implementation of sturgeon mitigation measures in PUD portions of the system. Coordination of hatchery development and monitoring efforts among areas may also promote economies of scale.

Under the expected terms of their new license agreements, sturgeon conservation and mitigation responsibilities in portions of the upper mid-Columbia will be implemented by the PUDs responsible for operating Priest Rapids, Wanapum, Wells, and Rocky Reach dams. Progress towards White Sturgeon Management Plans, as a part of these new License conditions is summarized below:

- A draft White Sturgeon Management Plan has been developed by the Grant County PUD for the Priest Rapids Project (Priest Rapids and Wanapum reservoirs) (GCPUD 2008) and is currently being reviewed by tribal, state and federal fisheries managers. The goal of the management plan is to promote growth of the population in the project area to a level that is commensurate with the available habitat by year 30 of the new license. To meet this goal, Grant County PUD is proposing a supplementation program to increase the population through use of hatchery-reared fish, fish that have been captured in the lower Columbia River for direct release into the reservoir or other methods recommended through a collaborative effort with relicensing stakeholders represented in a Priest Rapids Fish Forum established as part of the license.

- A Final White Sturgeon Management Plan has been developed by Chelan County PUD for the Rocky Reach Project. The overall goal of this Rocky Reach White Sturgeon Management Plan is to promote white sturgeon population growth in the [Rocky Reach] Reservoir to a level commensurate with the available habitat based on monitoring results. This is to be accomplished by meeting the following objectives: 1) increasing the population of white sturgeon in the Reservoir through implementing a supplementation program; 2) determining the effectiveness of the supplementation program; 3) determining the carrying capacity of available habitat in the Reservoir; and 4) determining potential for natural reproduction in the Reservoir, then adjusting the

supplementation program accordingly. FERC is currently reviewing proposed License conditions and is expected to issue a new License in spring, 2009.

- A Final White Sturgeon Management Plan has been developed by Douglas County PUD for the Wells Project. The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat consistent with its carrying capacity based upon a program involving supplementation activities, monitoring of results, and adjustment to the supplementation program as warranted by the monitoring results. Consistent with the other Mid-Columbia PUDs, Wells is seeking Settlement Agreements with tribal, state and federal resource managers to be included as a part of their new FERC License. These discussions are ongoing, with the new License scheduled to be issued in 2013.

D. Relationships to other projects

Historical Background

This project is a critical next step in long term sturgeon conservation, management, assessment, and research efforts currently underway in the Columbia River. This brief review of the historical background and related literature places the proposed research and restoration activity in the larger context of what work has been done, what is known, and what remains to be known.

Prior to development, the white sturgeon ranged freely throughout the Columbia and Snake River systems as far upstream as Windermere Lake in Canada and Shoshone Falls in Idaho. The unexploited population included large numbers of very large adults. This population and fishery collapsed in the late 1800s due to unregulated commercial fishing for the cannery industry (Craig and Hacker 1940; Galbreath 1985; Anderson 1988). Sturgeon numbers and fisheries in the lower Columbia increased steadily following 6-foot maximum fishery size limits enacted during the 1950s to protect adult spawners (Bajkov 1951). However, dam construction has drastically limited rebuilding of inland populations (Beamesderfer et al. 1995).

Interest in sturgeon gradually built after 1950 as numbers improved following protection of spawners and salmon numbers continued to decline. By the 1970s, increasing fishery participation and harvest led to questions regarding the sustainability of sturgeon populations and fisheries. Washington and Oregon Departments of Fish and Wildlife and the U.S. Fish and Wildlife Service initiated limited population assessments in the late 1970s and early 1980s which highlighted concern over impounded populations (Malm 1978; King 1981; Stockley 1981; Macy et al. 1997). However, basic information was lacking on sturgeon biology, limiting factors, habitat requirements, status, and population dynamics.

In 1983, concern for sturgeon trends and the lack of information led the Columbia Basin Fish and Wildlife Council's Resident Fish Technical Committee and the Bonneville Power Administration to organize a regional workshop on research needs (Fickeisen et al. 1984). White sturgeon work and research program implementation plans were completed in 1985 (Fickeisen 1985a, 1985b). Objectives included: 1) assessment of current status, 2) evaluation of the need for protection, mitigation, and enhancement, 3) evaluation of potential methods for protection, mitigation, and enhancement, and development of tools to assess the effectiveness of efforts.

In 1986, BPA funded a study to determine the status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam BPA (Project 1986-050-00).

The study was implemented cooperatively by the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U. S. Fish and Wildlife Service, and National Marine Fisheries Service (ODFW et al. 1987). A formal sturgeon stock assessment program was also initiated in 1986 downstream from Bonneville Dam by ODFW and WDFW using agency funds (ODFW and WDFW 2008). Results and conclusions of Phase I of the BPA-funded project were summarized in a 1993 final report (Beamesderfer and Nigro 1993a, 1993b) and have been widely published in the scientific literature (Elliot and Beamesderfer 1990; McCabe and Beckman 1990; Rien et al. 1994; Rien and Beamesderfer 1994; Beamesderfer 1993; North et al. 1993; McCabe et al. 1993; McCabe 1993; McCabe and Tracy 1994; Parsley et al. 1993; Parsley and Beckman 1994; Rieman and Beamesderfer 1990; Devore et al. 1995; Beamesderfer et al. 1995; Beamesderfer and Farr 1997).

In 1992, the Pacific States Marine Fisheries Commission completed a regional white sturgeon management framework plan which provided guidance for further research and management (PSMFC 1992). Planning involved a wide range of policy and technical staff from State, Federal and Tribal fishery agencies from California, Oregon, Washington, and Idaho. Goals included establishing and/or maintaining viable populations throughout the historic range, sustaining optimum benefits for diverse consumptive and on-consumptive uses, protection and enhancement of critical habitat, promotion of public awareness, and protection of the genetic integrity of local populations.

Phase II of the BPA-funded sturgeon project in the mid-Columbia began in 1992 based on recommendations of Phase I research (Beamesderfer and Nigro 1993c) and direction in the regional white sturgeon management framework plan (PSMFC 1992). Phase II included evaluations of: 1) effects of mitigation measures on productivity of populations downstream from McNary Dam and 2) status and habitat requirements in the mid-Columbia River upstream from McNary Dam and in the lower Snake River. Key mitigation actions in the area between Bonneville and McNary Dams included: A) continuing evaluations of flow requirements for sturgeon recruitment based on annual indexing of year class strength; B) implementation of an intensive fishery management plan based on catch monitoring and periodic stock assessment; and C) experimental evaluation of fish transplants from below Bonneville Dam as an alternative to passage. Phase II of this project is ongoing (Mallete 2008).

Sturgeon Hatchery Projects

Hatchery-evaluation projects for Columbia River sturgeon were initiated during the early 1980s. Initial efforts focused on laboratory work describing early life history and population genetics (Brannon et al. 1985a, 1985b, 1986, 1988; Setter 1989; Setter and Brannon 1992). Early genetic studies found less diversity in impounded populations relative to the population downstream from Bonneville Dam (Setter and Brannon 1992; Brown et al. 1992). A private aquaculture facility was also established on the lower Columbia River in 1981 under permit by Oregon to collect broodstock for use in commercial sturgeon hatcheries operating in California. This facility remains in operation at a small scale.

Development of effective conservation hatchery programs for white sturgeon in the Columbia Basin began in 1990 with an experimental program for Kootenai sturgeon (Apperson and Anders 1990; Anders 2002; KTOI 2007). Kootenai sturgeon are a unique isolated headwater population that were listed as endangered in 1994 in response to population declines caused by recruitment failure. This work was led by the Kootenai Tribe of Idaho and the Idaho Department of Fish and Game. The first artificial spawning of wild Kootenai white sturgeon occurred in 1990, initial

hatchery experimental construction was completed in 1991, the first hatchery releases occurred in 1992, a genetic breeding plan was established in 1993, disease management strategies were formalized in 1999 and the program was subsequently expanded as other efforts to restore natural recruitment have failed (Kincaid 1993; LaPatra et al. 1999; KTOI 2007; Ireland et al. 2002a, 2002b; Paragamian and Beamesderfer 2004; Paragamian et al. 2005). A similar hatchery conservation program was established in the Canadian upper Columbia in 2001 (Golder 2007) to address measures identified in an upper Columbia white sturgeon recovery plan (UCWSRI 2002) and the listing of upper Columbia River white sturgeon under the Canadian Species at Risk Act in 2003 (Wood et al. 2007). The program was expanded to the U.S. portion of the transboundary reach by the WDFW beginning in 2006 (Beamesderfer and Justice 2008).

Research efforts to determine the efficacy of using supplementation as an enhancement tool in mid-Columbia reservoirs were conducted under Phase II of the BPA-funded 85-50 sturgeon project from 1999 to 2003 by the Columbia River Inter-Tribal Fish Commission and the U. S. Fish and Wildlife Service. Wild broodstock were collected primarily from Bonneville and McNary reservoirs. Spawning and rearing occurred at a temporary facility at McNary Dam and at the Abernathy Fish Technology Center near Longview WA. A total of 20,600 juveniles were released in 2003 into Rock Island Reservoir near Wenatchee, WA. (Kappenman and Parker 2005). Rock Island was the primarily focus of this experimental hatchery release effort because the local population had been practically extirpated. Small numbers of hatchery juveniles (739) were also released into John Day reservoir in 2002 and 2005. Budget constraints in 2003 forced an early termination of production efforts (Kappenman and Parker 2005). Subsequent monitoring documented significant survival, growth, and downstream dispersion of hatchery juveniles released in Rock Island Reservoir (B. Parker CRITFC 1/5/06 memo). Hatchery fish dominated the catch of juvenile sturgeon in Rock Island, Wanapum, and Priest Rapids reservoirs which highlights the utility of using a known population of marked hatchery fish to assess wild fish numbers (B. Parker CRITFC 1/5/06 memo).

Basin-wide Sturgeon Activities

Sturgeon assessment, planning, and restoration activities have been extended throughout the Columbia and Snake River basins since 1990. Kootenai River sturgeon assessment and conservation efforts under the NPCC Fish and Wildlife Program began in 1989 and are ongoing (Apperson and Anders 1990; KTOI 2007; Paragamian et al. 2005). Canadian assessments of the transboundary population above Lake Roosevelt began around 1990 and are ongoing (RL&L 1994; Hildebrand et al. 1999; UCWSRI 2002; Irvine et al. 2007). A sturgeon recovery project was initiated in the U.S. portion of the transboundary reach under the NPCC program in 2003 (Howell and McLellan 2005). Extensive sturgeon assessments have been completed in the Snake River upstream Lower Granite by the Idaho Department of Fish and Game, Idaho Power, and the Nez Perce Tribe (Cochnauer et al. 1985; Hoefs 1997; Lepla et al. 2001). Plans for conservation, management, and restoration of sturgeon in the Snake River upstream from Lower Granite Dam have been completed by all three parties (IPC 2005; NPT 2005; IDFG 2008).

Sturgeon population status in Snake and mid-Columbia reservoirs upstream from McNary and lower Snake reservoirs downstream from Lower Granite was assessed from 1995-2002. Phase II of the Bonneville 1986-050-00 project sampled in McNary Reservoir and Hanford Reach in 1995 (Rien and Beiningen 1997), Ice Harbor Reservoir in 1996 (Ward 1998), Lower Monumental and Little Goose reservoirs in 1997 (Ward 1999), and Lake Roosevelt, Lake Rufus Woods, and Rock Island Reservoir in 1998 (Ward 2000). Status assessments in the mid Columbia PUD reservoirs were completed as part of FERC Relicensing efforts in Priest Rapids

and Wanapum reservoirs in 2000-2002 (Golder 2003), Rocky Reach in 2001-2002 (Golder 2002), and Wells in 2001-2002 (Jerald 2007) and PUD-funded efforts to address sturgeon issues in the PUD reservoirs are currently underway.

Related Mid-Columbia Projects

The Yakama sturgeon management project described in this narrative is closely affiliated and complementary to the ongoing sturgeon mitigation and restoration project in Columbia and Snake River reservoirs upstream from Bonneville Dam and the comprehensive strategic and master planning effort initiated under the MOA by the Columbia River Inter-Tribal Fish Commission (CRITFC) (Table 2, Table 3). Restoration needs and alternatives were identified in Phases I and II of the joint agency and tribal Columbia River sturgeon project (BPA #1986-050). Phase I of the CRITFC strategic and master planning project (BPA #2007-155) will involve all management partners in a comprehensive planning process to provide guidance for further restoration and monitoring actions in the FCRPS portion of the mid-Columbia and lower Snake rivers, including guidance for appropriate usage of hatcheries for sturgeon research or supplementation. Phase I of the Yakama sturgeon management project will provide critical input into the strategic and hatchery master planning process, help determine the potential suitability of tribal hatchery facilities for sturgeon, and facilitate implementation of appropriate hatchery-related measures identified in the strategic and master planning process. Guidance in the Strategic and Master Plans will be incorporated into the next phase of the joint Columbia River sturgeon project and further work by the Yakama Sturgeon Management Project.

E. Project history (for ongoing projects)

This project is being treated as a new project. However, both of the new Yakama Nation and CRITFC MOA sturgeon projects essentially restore funding to continue and expand upon the hatchery evaluation work initiated under BPA project 1986-050. Previous hatchery evaluation efforts under BPA project 1986-050-00 were suspended in 2003 due to funding limitations.

Table 2. Relationship to existing projects

Funding Source	Project #	Project Title	Relationship (brief)
BPA	1986-050-00	White sturgeon mitigation and restoration in the Columbia and Snake rivers upstream from Bonneville Dam	• Research and monitoring in this long-term effort is the basis for identification of the need for further hatchery evaluations • The next phase of this project is expected to incorporate research, monitoring and evaluation component s as appropriate for any future hatchery experiments or supplementation actions
BPA	2007-155-00	Comprehensive strategic and Master Plan for conservation, management and restoration of impounded sturgeon in the mid-Columbia and lower Snake Rivers	• This project will clarify the suitability and role of hatchery sturgeon, and develop detailed master and implementation plans for hatchery actions and evaluations as appropriate. • This work will guide Phase II of the YIN sturgeon management project and Phase III of the White sturgeon mitigation and restoration project.
YN	--	Cost sharing with revenue from the Grant County Relicensing agreement	• Discretionary tribal funds will be used to support a portion of this work
Mid-Columbia PUDs	--	White Sturgeon Management Plans for the PUD Projects (Implementation)	• Hatchery development and evaluation activities for will be coordinated between FCRPS and PUD portions of the system

Table 3. Phasing of implementation schedule for related mid-Columbia River sturgeon research, monitoring, and restoration projects.

	Columbia River Sturgeon ODFW, WDFW, CRITFC, USGS (BPA #1986-050-00)	Strategic & Master Planning CRITFC (BPA 2007-155)	Sturgeon Management Project Yakama Nation (BPA 2008-455-00)
1986-1991	Phase I Research tools & methods Status in lower mid-Columbia Habitat requirements & limitations Loss assessment Restoration alternatives		
1991-2008	Phase II Status in upper mid-Columbia & lower Snake Monitor lower mid-Columbia populations Optimize fishery management Evaluate flow requirements Evaluate transplants Pilot hatchery feasibility research		
2009-2010	Strategic planning to refine Phase III approach	Phase I Comprehensive Strategic Plan Master Planning Process (Step I) Policy review, production objectives, genetics management plan, evaluate site & operation alternatives, conceptual design, coordinated implementation & evaluation schedule	Phase I [a] Strategic Planning Refine expertise & methodology Identify facility requirements & costs Implementation plan for production (as appropriate) Development of research/monitoring/evaluation
2011-2018	Phase III To be determined based on outcome of Phase I & comprehensive strategic planning process	Phase II Master Planning Steps 2 (preliminary design) & 3 (final design & review) if appropriate Phase III Program Development & Implementation	Phase II [a] To be determined based on outcome of Phase I & comprehensive strategic planning process

[a] *May also involve cooperative efforts with mid-Columbia Public Utility Districts.*

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

The long-term goal of the Yakama Sturgeon Management Project (2008-455-00) described in this narrative is to facilitate restoration of population abundance and fishery benefits for white sturgeon in mid-Columbia River reservoirs between Bonneville and Priest Rapids dams.

Related to all Objectives (1-5):

Work Element 119: Manage and Administer Projects - Task 0.1

This will include project administration, internal coordination, and contract development. Annual work statements, budgets, and property inventories will be submitted to the BPA COTR.

Methods: *NA*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Funding package – internal review	8/15/2009	9/30/2009	30 day internal review period
B. Accrual – BPA submission		9/10/2009	Estimate of contract work that will occur prior to Sept but will not be billed until Oct 1 or later
C. Funding package – BPA submission		10/1/2009	Delivered to the COTR

Work Element 185: Produce Pisces Status Report - Task 0.2

The Contractor will report on the status of milestones and deliverables in Pisces. Reports will be completed either monthly or quarterly as determined by the BPA COTR. Additionally, when indicating a deliverable milestone as COMPLETE, the contractor will provide metrics and the final location (latitude and longitude) prior to submitting the report to the BPA COTR.

Methods: *NA*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Status Updates	2009	2010	Dates based on contract period TBD

Work Element 132: Produce (Annual) Progress Report - Task 0.3

The progress report will summarize the project objectives, hypotheses, completed and uncompleted deliverables, problems encountered, lessons learned, and long term planning. Examples of long-term planning include future improvements, new directions, or level of effort for contract implementation, including any ramping up or ramping down of contract components or of the project as a whole. Date range will be agreed upon by the COTR and the contractor and may or may not coincide with the contract period.

Methods: *NA*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Draft report for internal review		11/1/2009	Progress and results through Oct of contract year
B. Final report		12/31/2009	

Objective 1. Assist in the development of a recovery strategy, research and monitoring design, and hatchery Master Plan for depleted sturgeon populations in FCRPS portions of the mid-Columbia and lower Snake rivers.

The planning process for mid-Columbia and lower Snake River sturgeon (BPA Project 2007-155) is being organized and facilitated by the CRITFC and will include a 2009 workshop of regional fish management Tribes and agencies to refine objectives, strategies, measures, and near-term (10-year) implementation schedules and responsibilities for sturgeon conservation, management, and restoration in the mid-Columbia and lower Snake rivers. This work will include a thorough risk assessment for potential future use of sturgeon including elements identified in Table 4.

Work Element 189: Regional coordination – Task 1.1. Workshop Participation

YN staff will participate in the comprehensive strategic and master planning process including attendance at a 2-day planning workshop.

Methods: *Work will include presentation of a brief oral summary of past and planned project work and preparation of a written summary for inclusion in the workshop proceedings.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Workshop attendance		July 2009	Schedule to be finalized
B. Presentation & written summary	July 2009	August 2009	Powerpoint & 1-2 written pages

Work Element 174: Produce Plan – Task 1.2. Draft Strategic Plan Review & Comment

YN staff will contribute to completion of the comprehensive strategic sturgeon plan through review and comment on a draft developed by the CRITFC based on the regional planning workshop.

Methods: *Review and comment on draft plan including suggested revisions for strategies, measures, and schedule. Identification of significant objections that may warrant follow-up conferences or meetings.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Comments on draft plan	7/1/2009	7/31/2009	Assumes availability 1 mo. after workshop
B. Participation in follow-up	8/1/2009	9/30/2009	To be scheduled as needed

Table 4. Example performance standards and indicators to be considered in a formal risk analysis of potential future sturgeon hatchery programs (as per Comprehensive Strategic and Master Planning Project BPA 2007-155).

Performance Standard	*Type*	*Performance Indicator*
1. Maintain natural population	**Benefit**	Gradual increase in population size and age composition as a result of recruitment of hatchery fish: *Proportion of the size/age cohort contributed by hatchery* *Number of hatchery-reared fish by life stage including maturity* *Individual growth rates & condition factors* *Size & age specific survival rates* *Relative distribution and habitat use patterns of wild & hatchery fish*
2. Conserve genetic & life history diversity	**Benefit**	Retention of wild sturgeon life history characteristics and genetics by the hatchery reared population *Spawning matrices to maximize diversity* *Minimum effective population size* *Haplotype and genotype frequencies in hatchery broodstock & progeny* *Balanced contributions of family groups* *Avoidance of selective hatchery practices including grading* *Individual and population attributes as in #1 above.*
3. Research natural production limitations	**Benefit**	Understanding of the life history characteristics and factors limiting natural recruitment *Estimated natural cohort size relative to known hatchery release number* *Rearing bottlenecks between YOY and adult* *Effects of contaminants on development, survival, & growth* *Habitat capacity*
4. Increase effectiveness & reduce costs	**Benefit**	Adaptive approach to achieve results while reducing process, administrative overhead, & operation costs *Complete planning and review processes and move to multi-year funding schedule with check points* *Adapt size and time of release for maximum benefits and minimum risks* *Marking methods to distinguish hatchery and natural fish* *Larval release experiments if appropriate*
5. Avoid broodstock mortality	**Risk**	Additional mortality does not speed population decline *Mortality rate of broodstock in hatchery & after release* *Sustainable recruitment of natural broodstock through fisheries*
6. Do not exceed carrying capacity	**Risk**	No significant density-dependent trend in growth, condition, or behavior of wild or hatchery sturgeon *Individual and population characteristics as in #1 above*
7. Avoid disease transfer	**Risk**	Minimal incidence of disease in the facility *Appropriate spawning & rearing practices & densities* *Rigorous disease testing protocols* *Rear disease-free trout for bait and broodstock feeding*
8. Minimize behavioral or genetic impacts	**Risk**	See #2 above

Objective 2. Continue to develop critical expertise and refine effective sturgeon culture methodology for spawning and rearing of white sturgeon using tribal staff, facilities and resources, and captive broodstock.

The first phase of the project will include the development and refinement of sturgeon culture expertise and techniques using captive brood currently maintained on the Yakama Nation Reservation at the Prosser and Marion Drain Hatcheries. Experience of other sturgeon hatchery programs has repeatedly demonstrated that successful culture is as much an art as a science (KTOI 2007). Captive broodstock will provide useful test subjects for exploration and development of effective culture methods for white sturgeon. Spawning, incubation, and rearing methods and experience can be explored without the need to utilize wild fish from a depleted resident population.

Work Element 64: Spawn Fish – Experimental evaluation of sturgeon spawning techniques

The Yakama Nation has acquired approximately 97 broodstock from previous research projects in the Columbia River Basin. Approximately 71 sturgeon originated from the Pelfrey Sturgeon Hatchery on the Lower Columbia River in the early 1990s. These fish were used in a growth study conducted by WDFW and Fish Pro Inc. and were temporarily held in the K-Basin on the Hanford Reservation. In spring of 2008, 26 additional sturgeon were provided by the Columbia River Inter-Tribal Fish Commission from hatchery feasibility research conducted under project 1986-050. Some K-Basin fish have reached sizes and ages of adulthood and are expected to reach sexual maturity in each year. Adult males are typically believed to mature and spawn every year but adult females mature only periodically due to a multi-year egg developmental cycle and nutritional demands.

. Maturation and spawning success is highly temperature related and facility-dependent. This project will adapt and develop the techniques and training needed to successfully mature, induce, and spawn adult white sturgeon using the captive brood on hand.

Methods: *Identification of mature fish involves periodic surgical bioassay. Spawning of mature fish regulated by temperature and is induced by hormone injection. Eggs are hand stripped and hand fertilized. Eggs are de-adhesed with suspended clay. Up to 3 females will be spawned per year fertilized with available males in a 1-by-X matrix. Families will be reared separately to monitor relative performance.*

M&E: *Effectiveness (metrics: # maturing by sex, # successful inductions, spawning dates, eggs produced, mating matrix, fertilization success by family)*

Milestone	Start date	End date	Description
A. Maturation assessments	3/1/2009	5/1/2009	Surgical bioassay
	3/1/20010	5/1/2010	
B. Spawning induction & fertilization	5/1/2009	7/15/2009	Hormone injections
	5/1/2010	7/15/2010	

Work Element 59: Incubate eggs – Experimental evaluation of sturgeon incubation techniques

If captive broodstock can be successfully spawned, eggs will provide the opportunity to develop effective methods and experience. Incubation and hatching success requires an appropriate combination of water flow, water quality, and equipment.

Methods: *Sturgeon eggs are typically incubated and hatched in upwelling jars and spilled into troughs upon hatching.*

M&E: *Effectiveness (metrics: number & % hatched by family)*

Milestone	Start date	End date	Description
A. Egg incubation to hatch	5/1/2009	7/31/2009	2009 Brood year
	5/1/2010	7/31/2010	2010 Brood year

Work Element 63: Rear fish – Experimental evaluation of sturgeon rearing techniques

Rearing consists of applicable fish culture techniques which include feeding, cleaning, facility operation, and fish health maintenance. Juvenile rearing success has been widely observed to be highly variable and facility-dependent. It can be difficult to convert larval sturgeon to artificial feed. Growth and condition typically varies widely among individuals, even from the same families, and effective grading practices must be developed to avoid hatchery selection. This project will attempt to rear surviving progeny from spawning and incubation work. Fish will be reared at Prosser Fall Chinook/ Coho Hatchery and the Marion Drain Hatchery. Captive brood acquired from previous research projects will also be maintained. This work will provide the opportunity to develop effective methods and experience.

Methods: *Post larval fish will be reared in troughs until converted to feeding and then transferred to circular tanks like those used at other sturgeon hatcheries. Handling will be limited, light controlled, and densities will be maintained at low to moderate levels to avoid fish health issues. Fish health protocols will be adapted and followed. Fish will be subjected to annual or more frequent disease testing. Fish will be hand graded by size to allow small fish to compete successfully for food.*

M&E: *Effectiveness (metrics: water temperature by date, mortality by date, rearing densities, average weight, feed conversion, growth and survival by family)*

Milestone	Start date	End date	Description
A. Adult holding	1/1/2009	12/31/2010	Existing broodstock
B. Juvenile rearing	1/1/2009	12/31/2010	2007-2010 brood years

Work Element 157: Collect/Generate/Validate Field and Lab data – Collect Field Data

Experimental spawning, incubation, and rearing of hatchery sturgeon will provide an opportunity to develop effective data collection protocols.

Methods: *All data collected on aspects of operation including hatchery conditions, broodstock number and identity, maturation and spawning success, egg take, survival, growth, condition, disease status, rearing densities, etc. will be entered into standardized databases, verified for accuracy, and summarized for inclusion into annual reports.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Data entry	1/1/2009	12/31/2010	Regular entry as collected
B. Data summary	10/1/2009	11/1/2009	2009 report
	11/1/20010	12/1/2010	2010 report

Work Element 157: Collect/Generate/Validate Field and Lab data – Genetic Analysis of Captive Brood

Genetic sampling on the 71 captive brood acquired from the K-Basin project which were acquired from the Pelfrey Hatchery on the Lower Columbia River is necessary to distinguish siblings within the group because it is unknown if the fish are of a single parentage. This information will then be used to evaluate potential future suitability for out planting should it be identified as a strategy in the comprehensive plan.

Methods: *The genetic analysis will be conducted by the CRITFC genetics lab in Hagerman, Idaho based on either a single mitochondrial sequencing reaction or a series of comparable single nucleotide polymorphism "SNP" reactions, and a suite of microsatellites. Parentage of the 26 CRITFC-origin fish will also be evaluated as a blind control for the effectiveness of the analytical method. All 26 of the CRITFC fish are individually identified and PIT-tagged with parentage documented.*

M&E: *Effectiveness (metrics: relatedness of test (K-basin) and control (CRITFC) adults)*

Milestone	Start date	End date	Description
A. Genetic analysis	3/1/2009	9/1/2009	Laboratory work at Hagerman
B. Report (methods, results, discussion)	9/1/2009	10/1/2009	For inclusion in annual report

Objective 3. Identify facility and staff requirements and costs of hatchery alternatives for use in research/monitoring and hatchery master planning considerations.

Work Element 174: Produce Plan – Task 1.2. Draft Strategic Plan Review & Comment

Hatchery spawning, incubation, and rearing activities described under objective 3 above will provide the basis for informed estimates of facility and staff requirements and costs of hatchery alternatives for use in research/monitoring and hatchery master planning considerations. A fundamental question of the hatchery master planning effort is what will it take to produce the necessary fish? This work is designed to help answer that question based on practical experience.

Methods: *Based on exploration of spawning, incubation and rearing requirements at Yakama facilities identified in Objective 2, YIN staff will identify facility and staff requirements and costs for modification of tribal hatchery facilities for sturgeon production consistent with the needs identified in the regional strategic plan. Estimates will match the conceptual level consistent with step 1 of the hatchery Master Plan.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Conceptual estimates	9/1/2009	12/31/2009	Format TBD in master planning process

Objective 4. Develop a detailed implementation plan for production and rearing of juvenile sturgeon as appropriate for use in experimental research and hatchery feasibility evaluations (as identified in #1 above).

Work Element 174: Produce Plan – Task 1.2. Draft Strategic Plan Review & Comment

YN staff will develop a detailed implementation plan for production of hatchery sturgeon consistent with objectives and strategies identified in the master planning process. This objective will be contingent on the outcomes of the strategic and master planning processes. Based on hatchery needs identified in the strategic planning process, the master planning process will weigh a suite of alternatives for site and operation including modification of existing facilities, additions to existing facilities and new facilities. A number of tribes and agencies may have the capability and interest in developing a facility. As needed, hatchery site and operation will ultimately be based on a combination of technical considerations and policy guidance by the co-managers.

Methods: *The detailed implementation plan will be suitable for incorporation into the Step I master planning document.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
A. Implementation plan (internal review draft)	7/1/2010	10/1//2010	Format TBD in master planning process
B. Implementation plan (final draft)	11/15/2010	12/31/2010	

Objective 5. Assist in the development and implementation of effective experimental research/monitoring, and hatchery feasibility evaluations (as identified in #1 above).

Work Element 174: Produce Plan – Task 1.2. Draft Strategic Plan Review & Comment

YN staff will assist in the development and implementation of hatchery evaluations identified through the strategic and master planning processes. Evaluation components will include objectives, experimental design, test hypotheses, assumptions, methods for monitoring and evaluating results, desired precision, sample sizes, data collection protocols, analysis methods, and reporting. Evaluations will be developed as part of the CRITFC strategic and master planning process to consider the full complement of hatchery-related risks and benefits including appropriate genetic mating and production protocols to protect natural population characteristics.

Methods: *The detailed implementation plan will be suitable for incorporation into the Step I Master Plan.*

M&E: *Implementation/Compliance (metrics: milestones met, yes or no)*

Milestone	Start date	End date	Description
C. M&E plan (internal review draft)	7/1/2010	10/1//2010	Format TBD in master planning process
D. M&E plan (final draft)	11/15/2010	12/31/2010	

G. Facilities and equipment

Work will be conducted at existing facilities and may involve limited temporary modifications to adapt existing systems to sturgeon culture. These modifications are not intended primarily to increase the rearing capacity of the hatchery but rather to provide a suitable laboratory environment for sturgeon culture activities. Past experience has clearly demonstrated that temporary facilities like those identified by this project are suitable for short term experimental use but are not suitable for successful long-term sturgeon culture. The need for more permanent sturgeon culture facilities may be identified in the strategic planning process. Step one of the Hatchery Master Planning Process initiated by the CRITFC will consider alternatives for development of a more permanent facility including expansion of Yakama hatcheries along with other potential sites and operators.

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I. Key personnel

Project Leader	Donella Miller Yakama Nation Fisheries Resource Management Program P.O. Box 151 Toppenish, WA 98948 509-865-5121 donella@yakama.com
FTE:	1.0
Qualifications:	Bachelor of Science, Fisheries Resources University of Idaho, December 2008 On the job training at various sturgeon hatcheries in Washington, Idaho and British Columbia. Nearly 15 years of fisheries experience working on numerous projects throughout the Columbia River Basin. Capable of creating annual budgets and scopes of work for submittal to funding agencies in accordance with tribal policies.
Duties	Project lead/research position for YN Fisheries. The White Sturgeon Biologist is responsible for the development of a YN White Sturgeon Project that will conduct research and restoration activities of white sturgeon within the YN fisheries management geographic area, which includes the Mid-Columbia and Lower Snake Rivers. Additional responsibilities include the supervision of technical staff, management of project funding, working closely with other projects (habitat and artificial production) as they relate to specific project goals. Procuring all necessary permits relating to construction and project goals.

Program Manager	Steve Parker Yakama Nation Fisheries Resource Management Program P.O. Box 151 Toppenish, WA 98948 509-865-5121 parker@yakama.com
FTE:	0.05 FTE
Qualifications:	University of Washington Over 25 years of experience working with fisheries issues and projects in the Columbia River Basin.
Duties	Program oversight