Bonneville, The Dalles, and John Day Reservoir (Zone 6) White Sturgeon Management Units

Map Placeholder

The following pages are an analysis of ongoing monitoring programs, by reservoir, an evaluation of the quality of the information, and an evaluation of what would be needed to improve the monitoring. Evaluations shown in this document are drawn from the work completed by the Columbia River Fish and Wildlife Authority through direct participation of the fish co-managers, FCRP action agencies, Public Utilities, and others.

This evaluation was especially influenced by the participation of the Oregon Department of Fish and Wildlife, Washington Department of Fish and Game, and the Columbia River Inter-Tribal Fish Commission.

			Current Monitoring				Unaddressed ~~m~~Monitoring/Research N~~n~~eeds and D~~d~~ata G~~g~~aps			
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Bonneville	**Adult Abundance**	5 kg/ha	Adult Abundance	• 95% CI	• Adult abundance is estimated every three years (Sampling for white sturgeon is divided into three periods. During Period 1, gill nets are used to capture white sturgeon; during Periods 2 and 3, baited setlines are used to capture fish. Sampling effort is distributed equally through the reservoir and all reservoir sections are sampled during each period. Overall adult abundance (fish in the 70-109 cm FL size class) is estimated using a Schnabel population estimator. The length-frequency distribution of the setline catch is used to apportion the Schnabel population estimate by 1 cm increments within the 70-109 cm FL size class. The Schnabel estimate is then expanded to estimate abundance of the remaining size groups based on the	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)	• Quantify the loss of adult white sturgeon to illegal harvest. • Characterize population dynamics and carrying capacity • Determine level of mortality associated with catch- and-release fisheries. • Pollutant and contaminant affects on survival. • Quantify direct hydrosystem mortality caused by specific operational events. • Evaluate the loss of the historic prey base on survival. • Evaluate the affects of commercial navigation activities, including channel maintenance and commercial navigation on survival. • • •	•	•	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)

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					relative frequency of these size classesin the total setline catch and after adjusting for size specific differences in gear vulnerability. This method precludes the estimation of 95% confidence intervals for these groups.)					
Bonneville	**Adult Productivity**	**Harvest – 21% fish 42-60" (sport) and 25% fish 45-60" (commercial)**	• Year-class • Harvest	•	• Year-class (length-frequency distribution) estimated every three years (Study design and statistical analyses for length-frequency distribution described in the Adult Abundance and Species Diversity sections) • Harvest monitored annually (Angling effort (i.e., angler hours) is estimated by counting anglers within representative index areas and expanding those counts to the entire reservoir using an established relationship derived from previous aerial counts of anglers within and outside established index areas. Counts are	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)	• Improve precision/accuracy of aging • Determine level of mortality associated with catch- and-release fisheries. • Evaluate the affects of upstream conservation aquaculture programs. • Quantify the loss of adult white sturgeon to illegal harvest. • Pollutant and contaminant affects on reproduction. • The affects of habitat fragmentation and corresponding loss of access to ocean environments and nutrients on reproductive potential. • The effects of shifting hydrographs and thermographs influenced by impounding and climate change. •	•	•	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)

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					made of al bank anglers and sport fishing boats within an index area. Average number of anglers is determined from angler interviews. Angling effort within index areas is counted once a day between 1000 and 1300 hours. The portion of the day's total angling effort was calculated from average daily angling effort distributions derived from prior year's data when systematic counts were made throughout the day. Harvest estimates are calculated by multiplying observed catch per hour for boat anglers within a reservoir subsection by total estimated effort (i.e., hours) for boat anglers in that subsection. Harvest estimates are derived for bank and boat anglers, reservoir subsection, and weekend/weekday type to account for differential catch and sampling rates. Harvest and angling effort are derived for					

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					each week. To estimate the number of fish harvested in the tribal commercial fishery, pounds of white sturgeon is converted, from receiving tickets, to numbers of fish by dividing the total poundage by an average fish weight obtained during random biological sampling of tribal commercial landings. Landings by reservoir are estimated from the catch area reported on fish receiving tickets.)					
Bonneville	**Juvenile Productivity**		• Age-0 Abundance • Year - class	•	• Annual age-0 sampling at specific index sites (Age-0 white sturgeon are sampled in the fall using gillnets at predetermined sites. Nets are set overnight at the same site during a week-long period and fish on the bottom for a 24-hour period. Each overnight set is considered a single unit of effort. All captured fish are measured to the nearest 1mm FL and	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)	• Improve precision/accuracy of aging • Evaluate the affects of upstream conservation aquaculture programs. • Identify critical habitats used by early life stages and effects of environmental variables on year class strength. • Assess the impacts of predation on early life history stages by sympatric fishes. • The effects of shifting hydrographs and thermographs influenced by impounding and climate change.	•	•	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)

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					examined for marks. Proportion of positive efforts, ~~and~~ CPUE, and length frequency of gill net catch are estimated.) • Year-class (length-frequency distribution) estimated every three years (Study design and statistical analyses for length-frequency distribution described in the Adult Abundance and Species Diversity sections)		• Pollutant and contaminant affects on survival of early life history stages. • The effects of shifting hydrographs and thermographs influenced by impounding and climate change. • Evaluate the affects of flow and flow variability on survival of early life history stages.			
Bonneville	**Spatial Distribution**		• Adult distribution • Age -0 distribution	•	• Annual age-0 sampling at specific index sites (Study design and statistical analyses described in the Juvenile Productivity section) • Every three years, assess annual growth, length-weight relationships, relative weight, overall population abundance as well as abundance by specific size classes (Study design and statistical analyses described in Adult Abundance and Juvenile Productivity	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)	• Identify critical habitats used by early life stages and effects of environmental variables on year class strength. • Understand seasonal and diel habitat use by various life stages of white sturgeon. • The effects of shifting hydrographs and thermographs influenced by impounding and climate change.			• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded)

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					sections)					
Bonneville	**Species Diversity**	•	• Age • Growth • Length-weight • Relative weight • Genetics	•	• Every three years, assess annual growth, length-weight relationships, and relative weight (Age of captured fish is estimated from cross-sections of pectoral spines. Up to 30 fish from each 20 cm length interval are aged. Cross sections are aged two times by each of the two readers, with one of the readers being assigned the role of primary reader. When an age assigned to an individual fish is not consistent between readers, the primary reader will assign a final age to the fish. The relationship between white sturgeon fork length and age is described by the von Bertalanffy growth function. Parameters for the von Bertalanffy growth function are derived from the length and age data using nonlinear regression. Parameters for length-weight	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded) • Project 200850400 – Genetic Stock Structure, Relative Productivity, and Migration (Gene Flow) of White Sturgeon among Bonneville, The Dalles, John Day, and McNary Reservoirs in the Lower Mid-Columbia River Region	• Improve precision/accuracy of aging • Assess the nutritional value of current prey base. • Evaluate the loss of the historic prey base on survival, condition and reproductive potential. • Evaluate the affects of upstream conservation aquaculture programs. •	•	•	• Project 19860500 – White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam (BPA-funded) • Project 200850400 – Genetic Stock Structure, Relative Productivity, and Migration (Gene Flow) of White Sturgeon among Bonneville, The Dalles, John Day, and McNary Reservoirs in the Lower Mid-Columbia River Region

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					functions are derived using nonlinear regression. Relative weight is estimated based on existing standard weight equations. Analysis of variance and Tukey's pairwise comparison are used to test for significant differences in relative weights.) • Evaluate population differentiation and gene flow. • Determine relatedness and effective population size • Characterize broodstock and degree of relatedness. (Assess reservoir specific genetic diversity. Up to 1000 juvenile white sturgeon will be sampled annually for a ten year period. Fish will be genotyped at 14 standardized uSAT loci. Population allele frequencies, mean heterozygosity, and private alleles among populations will be calculated. Pairwise genetic distances will be estimated and phylogenetic trees will be constructed. In addition, principle coordinates analysis will be performed using a standardized covariance matrix of					

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					genetic distance. Partitioning of within- and among-components of total genetic variation will be analyzed. Population homogeneity, membership coefficients, or fractional membership in K inferred populations for each individual sample in each population will be determined as will levels of gene flow.)					
Hatchery X	**% marked at release** **PNI**		Marks Spawner surveys	100%	None	•	•	•	•	•

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