2022 Annual Report on the Effects of the Operation of Libby Dam and the Implementation of Non-operational Measures on the Kootenai River White Sturgeon

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The U.S. Army Corps of Engineers (Corps), Bureau of Reclamation (Reclamation) and Bonneville Power Administration (Bonneville), as co-lead agencies, developed the 2020 Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA). Concurrently with the development of the CRSO EIS, the co-lead agencies consulted with the U.S. Fish and Wildlife Service (Service) and the National Marine Fisheries Service on the effects to threatened and endangered species from operations and maintenance of the CRS, consistent with Section 7 of the Endangered Species Act (ESA). The Service issued their Biological Opinion (2020 CRS BiOp) for the operations and maintenance of the CRS in July 2020, analyzing the effects on Kootenai River white sturgeon (*Acipenser transmontanus*; sturgeon) and bull trout (*Salvelinus confluentus*) and their designated critical habitat.

The Service's 2020 CRS BiOp requires that the Action Agencies provide an annual report to the Service summarizing the adverse and beneficial effects of the action on sturgeon by March 31 each year over the term of the action. The actions described herein are primarily funded by Bonneville. This report is submitted to fulfill this requirement, and "…*includes information on the implementation and status of 1) the Kootenai sturgeon conservation aquaculture program; 2) the flow-planning protocol process; 3) the Kootenai River Habitat Restoration Program; 4) the nutrient addition program; and 5) Kootenai sturgeon monitoring and reporting"*, as follows:

I. Conservation Aquaculture Program

Bonneville funds the Kootenai Tribe of Idaho (KTOI) to implement conservation aquaculture programs in accordance with the terms outlined in the Memorandum of Agreement (MOA) between Bonneville and the KTOI for the KTOI's Kootenai River Native Fish Conservation Aquaculture Program (KRNFCAP or Program) for endangered sturgeon.

The goals of the KRNFCAP are to prevent extinction of the endangered sturgeon population and reintroduce burbot (*Lota lota maculosa*), both of which are culturally significant resources to the KTOI, related First Nations, and the citizens of the Kootenai Basin. The Program goals are to rebuild a healthy age-class structure using conservation aquaculture techniques with wild, native broodstock, and preserve the existing gene pool by spawning, rearing, and releasing fish that survive, grow, and mature. The next generation of sturgeon will be predominantly hatchery-origin; these fish supply the reproductive potential to restore a self-sustaining population that would also support Tribal subsistence and cultural harvest and a public sport fishery. To date, the Program has successfully warded off extinction and rebuilt a healthy age-class structure by spawning >450 wild adults (~150 females crossed with ~300 males) and creating >350 unique families across >30 year-classes during 1990-2022. The annual spawning plan captures approximately 80% of the genetic diversity from each wild spawning class (annually, since 2012); and overall has captured 96% of the genetic diversity of the wild population.

KTOI staff captured 11 females between March 29th and June 17th, 2022. A total of 10 adult female sturgeon were transported to the Kootenai Tribal Sturgeon Hatcheries between March 29th and June 17th. Two of the 10 females transported to the hatcheries were caught by Idaho Department of Fish and Game (IDFG) on setlines. A total of 60 male adult sturgeon were captured between March 30th and June 27th. Between June 2nd and June 14th, 13 adult males were transported to the Kootenai Tribal Sturgeon Hatcheries to use for spawning in-hatchery. Overall, a total of 25 males were used in spawning activities.

Egg quality was determined to be good for eight of the females; however, one female became over-ripe, resulting in poor fertilization. Spawning events occurred from June 13th to June 23rd. A total of eight family groups were created using eight females and 25 males. A total of 25 unique crossings were created. All eight family groups created were split between the two KTOI hatcheries post-fertilization for grow-out. With approximately 269,680 eggs collected and an average of 81% neurulation, an estimated 219,238 larvae were hatched out for hatchery production of the 2022 year-class.

New in 2022, a portion of all family groups were released as fertilized eggs or as yolk-sac larvae in addition to spawn retained for hatchery production. Eggs and larvae were released into designated critical habitat near Bonners Ferry, Idaho. A total of 142,000 fertilized eggs were released and a total of 284,000 yolk-sac larvae were released. Parental Based Tagging (PBT) will be used to verify egg and larvae release survival.

A complete report titled "Hatchery Management Plan Supporting Kootenai River White Sturgeon Restoration" detailing activities in 2021 can be found at https://www.cbfish.org/Document.mvc/Viewer/P190180. The final report on 2022 hatchery management activities will be completed consistent with existing contractual requirements and uploaded to CB Fish (www.cbfish.org) when completed.

II. Flow Planning Implementation Protocol (FPIP)

To increase the likelihood of sturgeon migration to appropriate spawning areas and to increase the probability of survival of eggs, larvae, and juveniles, Libby Dam provides flow augmentation using a tiered set of volumes of water (6 tiers ranging from 0-1.6 Million Acre-Feet (MAF) based on the May Water Supply Forecast (WSF) for April-August for Koocanusa Reservoir. Actual flow releases are shaped according to in-season management of available water, in coordination with the Technical Management Team (TMT) and seasonal requests from the Service. The sturgeon volumes are accounted for above the 4,000 cubic feet per second (cfs) minimum releases from Libby Dam; accounting for these tiered volumes begins when the Corps-led FPIP Technical Team determines benefits to the conservation of sturgeon are most likely to occur. Sturgeon volume accounting also occurs when additional flow above minimum discharge is needed to sustain a base flow of 6,000 cfs from May 15 to May 31 (minimum bull trout flow), regardless of sturgeon augmentation commencement.

The 2022 FPIP Sturgeon Flow Augmentation Operation at Libby Dam was implemented May 16 through June 16. Based on the May Koocanusa Reservoir WSF of 6.74 MAF, 2022 was a Tier 4 year with a minimum volume available for sturgeon flow augmentation operations of 1.15 MAF, as per the Proposed Action (see Figure 2.2, page 2-36 in the CRS BA). Libby Dam discharge volume was shaped following 2020 CRS BA ramping rates to target flow and elevation objectives in the lower river near Bonners Ferry. The FPIP Technical Team prepared the 2022 Sturgeon Flow Augmentation Recommendation and the Service prepared and submitted a System Operation Request (SOR) based on this recommendation. The SOR was vetted and discussed by TMT and approved by the co-lead agencies on May 11, 2022. The 2022 SOR can be found at extension://efaidnbmnnnibpcajpcglclefindmkaj/https://pweb.crohms.org/tmt/sor/2022/0511_2022_Final_Libby_Sturgeon_SOR.pdf

As per the Service's SOR, which was based on the FPIP Technical Team Sturgeon Flow Augmentation Recommendation, Libby Dam was operated in real time to achieve the following objectives:

1) Provide river stage at Bonners Ferry of ≥ 1,760'+ Mean Sea Level (MSL; flood stage is 1,764') for as many days as possible during the peak of the local tributary discharge downstream of Libby Dam.

2) Provide flows at Bonners Ferry of ≥30,000 cubic feet per second (cfs) for a duration concurrent with maximizing the duration of Kootenai River stage as per Objective 1; and

3) Provide a sharply receding hydrograph upon completion of the flow augmentation operation following Biological Opinion ramping rates from peak discharge to summer discharge (9,000 cfs in Tier 4).

Kootenai River flow at Bonners Ferry was ≥30,000 cfs for 33 days, and river stage at Bonners Ferry was ≥ 1,760' MSL for 13 days. River stage during the spring freshet is strongly influenced by local tributary discharge downstream of Libby Dam, as well as the elevation of Kootenay Lake, which is managed for flood risk reduction in compliance with the 1938 International Joint Commission Rule curve. The cool spring weather delayed local tributary discharge downstream of the dam and inflow into Koocanusa Reservoir by approximately 2 weeks, with peak inflow (~82,000 cfs) into the reservoir not occurring until 13 June; the reservoir drafted several feet during the peak sturgeon flow augmentation period, which is atypical. The hydrograph at Bonners Ferry peaked at ~43,000 cfs on 14 June and receded to ~20,000 cfs by the end of June before slowly receding to the bull trout minimum flow at Libby Dam (9,000 cfs) through July and August.

The Selective Withdrawal System (SWS) crane at Libby Dam was not functional during the 2022 FPIP Sturgeon Flow Augmentation Operation, but was back in service on 23 June, at which point SWS gates were installed incrementally to discharge warmer surface water from the forebay of the reservoir. Temperature in the Bonners Ferry reach during implementation of the Sturgeon Flow Augmentation Operation ranged from ~ 42 to 50° F, though temperatures of 50°+ F at Bonners Ferry were not consistently observed until discharge from Libby Dam was reduced to 11-12,000 cfs in late June.

A summary of the 2022 FPIP Sturgeon Flow Augmentation Operation can be found at https://pweb.crohms.org/tmt/documents/Kootenai-River/2022

III. Kootenai River Habitat Restoration

In July 2009, KTOI completed the *Kootenai River Habitat Restoration Program Master Plan* (KRHRP) (http://www.restoringthekootenai.org/habitatRestoration/masterPlan/), which presents a framework for potential large-scale ecosystem-based river habitat restoration projects to be implemented in a 55-mile reach of the Kootenai River extending from the confluence of the Moyie and Kootenai rivers downstream to the Canadian border.
The goals for the KRHRP address:

- Morphology – Enhance physical habitat by reducing the negative effects to river and floodplain ecological processes caused by river response to the altered landscape.
- Riparian vegetation – Enhance native vegetation by establishing stream bank and floodplain conditions that sustain plant community development processes.
- Aquatic habitat – Enhance aquatic habitat conditions that support all life stages of native fish and promote sustainable populations.
- River stewardship – Create opportunities for river and floodplain stewardship in the

community.

As identified in the KRHRP implementation milestones, KTOI, in coordination with the Corps, Bonneville, and multiple co-managers, is continuing to implement the KRHRP. This work is being accomplished primarily with Bonneville funding (with some additional funding secured by KTOI). Phase 1 (Braided Reach) and Phase 2 (Braided Reach and Straight Reach) of the KRHRP were implemented during 2012 – 2019, and Phase 3 (Meander Reach) continued through 2020-2022 and included:

- During 2022, KTOI completed the Lower Deep Creek Channel Reconstruction and Floodplain Reconnect. KTOI partnered with Idaho Department of Lands (IDL) to enhance a 150-acre IDL property adjacent to the Kootenai National Wildlife Refuge and just upstream of the Deep Creek confluence with the mainstem Kootenai River. Deep Creek is an important ecosystem component. Channel reconstruction, several floodplain reconnects, and re-establishing riparian habitat along Lower Deep Creek should substantially enhance ecosystem function by providing much needed biological inputs to the section of the mainstem Kootenai where sturgeon spawn, hatch, and rear.
- During 2022, KTOI also completed maintenance within the past Braided-Reach projects; and solidified a partnership with the Service to implement habitat restoration within the Kootenai National Wildlife Refuge during 2023, and possibly a series of future projects.

For additional information see the Kootenai River Habitat Restoration Program for Kootenai River White Sturgeon (BPA Project #: 2002-002-00) and Kootenai River Ecosystem Operational, Mitigation and Evaluation program (KROME) (BPA Project #: 2002-011-00). Reports for both projects are completed within existing contractual requirements and will be uploaded to CB Fish (www.cbfish.org) as they are completed.

IV. Kootenai River and Kootenay Lake Nutrient Addition

The overarching goal of the nutrient addition projects are to restore a productive, healthy, and biologically diverse lower Kootenai River and Kootenay Lake ecosystem, with emphasis on native fish species rehabilitation. It is especially designed to benefit important fish stocks, i.e., sturgeon, burbot, bull trout, kokanee, and several other salmonids important to the KTOI and regional sport-fisheries.

Bonneville funded nutrient addition activities, like previous years, in the Kootenai River, Idaho, and Kootenay Lake, British Columbia. The KTOI implemented the riverside nutrient addition station; and the British Columbia (BC) Ministry of Forests, Lands, Natural Resource Operations and Rural Development implemented the south Arm Kootenay Lake addition station. Reporting for 2019 is at https://www.cbfish.org/Document.mvc/Viewer/P168270. Due to COVID-19 and personnel and programmatic changes within KTOI, Bonneville's project sponsor for implementing nutrient additions to benefit KRWS, reporting for 2020-2022 is delayed, but will be available at www.cbfish.org when completed.

V. Sturgeon Monitoring and Reporting

2022 IDFG and British Columbia Ministry of Forests (BCMF) Sturgeon Monitoring

In 2022, IDFG (funded by Bonneville) and BCMF monitored juvenile and adult sturgeon populations, spawning migrations, and spawning success in the Kootenai(y) River and Kootenay Lake. A total of 184

adult sturgeon were caught with setlines and angling in both ID and BC, which represents a decrease from 2021 (n = 214). Proportions of wild and recaptured fish were similar. The proportion of spawning sturgeon that migrated above the Highway 95 bridge to suitable habitat in 2022 (34%) was typical given the duration of peak flows (33 days > 30kcfs at Bonners Ferry). Flows were successful in triggering spawning, and 448 eggs were collected on egg mats, which is an increase from 2021 (n = 197). Of these, 76 were collected over gravel substrates at River Kilometer 245.5, which is the most in this portion of the river since comparable surveys started in 2010. A total of 48 larval sturgeon were captured in passive drift nets, which is by far the highest catch since comparable surveys began in 2014 (maximum = 3; mean = 1.25). Results from PBT analysis will not be available until late 2023, therefore it is currently unknown how many larvae captured in 2022 were from KTOI hatchery releases of eggs and larvae, and how many were from natural production. A total of 707 sturgeon were caught in gillnets in both ID and BC. Of these, 698 were juveniles (513 in ID and 185 in BC), which is a decrease from 2021 (n = 1,736). However, most gillnetting was performed in 2022 using a generalized random tessellation stratified (GRTS) design. Due to the random nature, catch rates for GRTS sites were approximately half the catch rates for index sites. Still, catch rates for index sites were lower in 2022 (mean = 2.6 sturgeon/net*hour) than in 2021 (mean = 3.2 sturgeon/net*hour). No new wild juvenile sturgeon were captured during 2022 gillnet surveys. Further analyses and findings will be reported in the 2021-2022 annual report.

Additional information on biological monitoring related to sturgeon flows is available from BPA Project #: 1988-065-00. Reports associated with this project are completed consistent with existing contractual requirements and will be uploaded to CB Fish (www.cbfish.org) as they are completed.

2022 Montana Fish, Wildlife & Parks (FWP) Sturgeon Monitoring and Reporting

Since 2009, 556 sturgeon (256 individuals) have been captured in Montana and the number captured annually ranged from 2-77. Catch per unit effort of sturgeon since 2009 appears to be increasing in all standardized reaches currently being sampled in Montana. The capture/recapture data collected over the past 14 years allowed evaluations of various metrics including abundance, growth, condition, brood year composition, wild vs. hatchery contributions, apparent annual survival, movement, residency and sexual maturity. Following the 2022 sampling season, approximately 260 sturgeon were estimated in Montana and abundance is increasing by about 15 sturgeon per year. Abundance of sturgeon in Montana has likely increased since the 1970s, in large part due to the KRNFCAP. Estimates of condition (mean W = 81) and growth are comparable to estimates downstream in Idaho and British Columbia. Growth (i.e., in terms of length) is highest for younger sturgeon and averages 35-40 mm/yr. after age-15. The age composition of sturgeon in Montana appears to be mostly older juveniles (i.e., ≥ 10-15 years old). Apparent annual survival of sturgeon in Montana is high (93%) and our results are consistent with other apparent survival estimates in the Kootenai River. Nearly 99% of all sturgeon captured in Montana were of hatchery origin. Approximately 90% of the hatchery origin sturgeon with known release records captured in Montana were released in Idaho or British Columbia. Of the 46 sturgeon sonic tagged in Montana since 2012, 61% have not emigrated since tagging indicating longer term residency. About 25% of the sonic tagged sturgeon emigrated from and later returned to Montana and the remaining 10-15% left Montana and have not returned to date. Abundance of wild adult sturgeon in Montana appears to be low based on infrequent captures, sightings, and detections of radio/sonic tagged adult sturgeon over the past 10-15 years. At this time, there is no evidence of spawning by wild or hatchery origin sturgeon in Montana but spawning by larger/older juveniles may be possible in the next 5-10 years. Continued monitoring of sturgeon in Montana will provide additional information used to adaptively monitor, manage, and evaluate efforts to benefit sturgeon within the Kootenai(y) River and Kootenay Lake ecosystem.

Additional information for Montana Fish, Wildlife & Parks Kootenai Sturgeon Monitoring and Reporting can be found under BPA Project #: 1995-004-00. Reports associated with this project are completed consistent with existing contractual requirements and will be uploaded to CB Fish (www.cbfish.org) as they are completed.

If you have trouble accessing any of the cited, hyperlinked reports on CB Fish, please contact Bonneville's F&W ESA Coordinator at: **FWESAcoordinator@bpa.gov.**