WHITE STURGEON MITIGATION AND RESTORATION IN THE COLUMBIA AND SNAKE RIVERS UPSTREAM FROM BONNEVILLE DAM

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EXECUTIVE SUMMARY

We report on our progress from January through December 2022 on determining the status of White Sturgeon populations and effects of mitigation measures on productivity in the Columbia River downstream from McNary Dam to Bonneville Dam. The study is a cooperative effort by the Oregon Department of Fish and Wildlife (ODFW; Report A), Washington Department of Fish and Wildlife (WDFW; Report B), and Columbia River Inter-Tribal Fish Commission (CRITFC; Report C). This report also serves as the study's annual technical report on Bonneville Power Administration funded Research, Monitoring and Evaluation (RM&E) projects.

This is a multi-year study with many objectives requiring more than one year to complete; therefore, findings from a given year may be part of past reports or alternatively, may be part of more significant findings that are yet to be reported. Highlights of the 2022 results are:

Report A

- Overall abundance of White Sturgeon >54 cm Fork Length (FL) in John Day Reservoir was 31,454, a decrease of 6% from the estimate in 2019.

- Abundance of legal-size fish (110 – 137 cm FL) decreased from 2019 (n = 6,443) to 2022 (n = 5,660).

- Condition (relative weight) decreased for all size classes. Mean relative weight of White Sturgeon less than 70 cm FL had the greatest decrease, which is also the lowest estimate for the size class in the time series, though data were limiting.

- Age-0 recruitment was detected in Bonneville (n=45) and The Dalles (n=1) reservoirs, though Ep and CPUE remain low despite favorable hydrological conditions during spawning months.

Report B

- The number of White Sturgeon retention days in 2022 was 30 in Bonneville Reservoir, 35 in The Dalles Reservoir, and 68 in John Day Reservoir.

- Sturgeon sport harvest estimates were 622 (92% of guideline) for Bonneville Reservoir, 204 (107% of guideline) for The Dalles Reservoir, and 94 (90% of guideline) for John Day Reservoir.

- Recreational anglers overall had lower effort and corresponding catch rates than observed in the 2021 fishery.

- Oversize catch in Bonneville Reservoir was 0.8% of the 2021 oversize abundance estimate and 0.6% of total 2022 sturgeon catch (oversize catch is not monitored outside of retention seasons). In The Dalles Reservoir, oversize catch was 2.5% of the 2020 oversize abundance estimate, and 7.5% of total 2021 sturgeon catch. In John Day Reservoir, oversize catch was 0.5% of the 2022 oversize abundance estimate, and 26.5% of total 2021 sturgeon catch.

Report C

- Tagging efforts in Bonneville Reservoir captured in 981 White Sturgeon in 591 overnight gillnet sets, a catch per unit effort (CPUE) of 1.7 sturgeon per set. These are the lowest CPUE values in the past two decades of sampling.

- Captured fish ranged from 68 – 289 cm fork length (FL), with a mean length of 114.7 cm FL. The mean length for 2022 was a 14.5 cm increase from mean fork length observed in 2015-2016.

- The proportion of sublegal sized (<109 cm FL) catch was 46.3%, the proportion of legal sized catch (109-137 cm FL) was 38.7%, and the proportion of oversize (> 137 cm FL) catch was 15.0 % of the total observed.

- The shifts in sublegal and legal sized fish shows the continued movement through size classes of the late 1990s recruitment spike.

WHITE STURGEON MITIGATION AND RESTORATION IN THE COLUMBIA AND SNAKE RIVERS UPSTREAM FROM BONNEVILLE DAM

ANNUAL PROGRESS REPORT

JANUARY – DECEMBER 2022

Report A

Evaluating the success of developing and implementing a management plan for enhancing production of White Sturgeon in reservoirs between Bonneville and McNary dams

This report includes: 1) An update of abundance, life history parameters, and population dynamics of White Sturgeon in the John Day Reservoir, and
2) A summary of annual recruitment of age-0 White Sturgeon in three Columbia River reservoirs; Bonneville, The Dalles, and John Day.

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ABSTRACT

This report summarizes data collected from January 1, 2022, through December 31, 2022, and provides: 1) an update of the abundance, life history parameters, and population dynamics for White Sturgeon *Acipenser transmontanus* in John Day Reservoir and 2) and evaluation of annual recruitment of age-0 White Sturgeon in the three lower impounded Columbia River reservoirs.

Sampling to estimate the abundance of White Sturgeon in John Day Reservoir was a cooperative effort among staff from Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fish and Wildlife (WDFW), the Columbia River Inter-Tribal Fish Commission (CRITFC), and Yakima Nation (YN). The estimated abundance of White Sturgeon ≥ 54 cm FL in John Day Reservoir in 2022 was 31,454 (95% CI: 25,303 – 42,055); a 6% decrease from the 2019 abundance estimate. There was also a decrease in five of the six size class structures in which populations are sub-grouped. The greatest decrease was observed in the smallest size class, fish measuring 54 – 70 cm FL. This group experienced a decrease of 94% from the previous survey conducted in 2019. The one size class that showed an increase was that of fish measuring over 166 cm FL, in which a 145% increase was observed. The overall mean relative weight of White Sturgeon in John Day Reservoir decreased from 111.6 to 104.7. Although still considered healthy, the condition of White Sturgeon has decreased in all size class groups.
We assessed recruitment of age-0 White Sturgeon in Bonneville, The Dalles, and John Day reservoirs during October 2022. Recruitment was detected in Bonneville and The Dalles reservoirs but not in John Day Reservoir. Although Ep and CPUE has decreased slightly from the 2021 survey in Bonneville Reservoir, it has increased in The Dalles Reservoir in which there was no measurable recruitment detected in 2021. The lack of noticeable recruitment in the John Day Reservoir is an annual trend. There has only been measurable recruitment in the John Day Reservoir once in the last ten years. The John Day Reservoir continues to be an area of concern with prolonged periods of no age-0 recruitment. With this being evident, even during years with favorable river flows and temperatures, it must be considered that other environmental and ecological factors may influence spawner response and success in this reservoir.

INTRODUCTION

White Sturgeon, *Acipenser transmontanus*, is the largest species of North American sturgeon and is found from southern California to the Gulf of Alaska (Scott and Crossman 1973). White Sturgeon inhabit approximately 1,600 km of the main stem Columbia River from the estuary along the Oregon/Washington border to Idaho and Canada. Overharvesting during the late 1800s resulted in substantial population declines, meriting the first protections placed on sturgeon harvest within the Columbia and Snake river systems. In 1899, Oregon and Washington state agreed to extend seasonal closures as well as a minimum size limit for harvested fish (Craig and Hacker 1940). By the 1950s, White Sturgeon abundance had increased enough to support limited commercial and recreational fisheries. Declining harvest opportunities for anadromous salmon and steelhead, *Oncorhynchus spp.*, at this time led to increased angular participation in the White Sturgeon fishery. Harvest of White Sturgeon doubled in the 1970s and again in the 1980s (Tracy 1993). In 1986, Oregon Department of Fish and Wildlife (ODFW) and other state, tribal, and federal agencies began long-term monitoring of sturgeon populations in the impounded lower Columbia River reservoirs (ILCRR), from Bonneville Dam to the mouth of the Snake River. This monitoring work was intended to develop a better understanding of White Sturgeon population dynamics and aid in developing appropriate management and mitigation actions to maintain and enhance White Sturgeon populations.

Project goals have evolved over time as new information becomes available. The current focus of this project is to implement and evaluate measures (i.e.: harvest closures, catch quotas, size limits, and sanctuaries) to protect and enhance White Sturgeon populations, and to mitigate the effects of the Federal Columbia River Power System (FCRPS) on the production of White Sturgeon in the ILCRR.

To assess the productivity of White Sturgeon populations, abundance and recruitment are measured throughout the impounded lower Columbia River basin. Stock assessments have been conducted on a three-year rotation among the ILCRR since 2001 to evaluate White Sturgeon abundance and population dynamics. These data are critical for assessing management and mitigation approaches. Recruitment of age-0 White Sturgeon is monitored in each reservoir annually to evaluate the relative success of spawning. This information has helped identify recruitment trends over time within individual reservoirs.
This report summarizes work performed from 1 January 2022 through 31 December 2022 for the Bonneville Power Administration Project 1986-050-00. During this period, staff from the ODFW, Washington Department of Fish and Wildlife (WDFW), Columbia River Inter-Tribal Fish Commission CRITFC), and Yakima Nation (YN) collaborated on two large scale efforts to assess White Sturgeon populations in the impounded reaches of the lower Columbia River upstream from Bonneville Dam:

1) From 6 June through 1 September 2022, we sampled for White Sturgeon in John Day Reservoir to update information on abundance, growth, survival, and condition.
2) During October 2022 we sampled for age-0 White Sturgeon in Bonneville, The Dalles, and John Day reservoirs to assess the relative annual spawning success in these reservoirs.

METHODS

Stock Assessment

Sampling for White Sturgeon in the John Day Reservoir was divided into three separate events identified as periods 1 through 3. Sampling during period 1 took place from 29 November 2021 through 29 January 2022. Sampling was conducted by Tribal commercial fishers, contracted by CRITFC staff, using gill nets as a capture method (see Report C for details regarding Tribal gill net methodology). Sampling took place throughout the entire John Day Reservoir, excluding boat restricted zones. Sampling for periods 2 and 3 took place from June through August involving staff from ODFW, WDFW, CRITFC and YN utilizing baited setlines as a sampling method. Period 2 sampling occurred from 6 June 2022, through 7 July 2022, while period 3 took place from 1 August 2022 through 1 September 2022. To structure sampling activities, the John Day Reservoir was divided into 10 sections (Figure A-1); with each section measuring approximately 10 km in length, excluding the boat restricted zones. Sampling effort was distributed equally throughout the reservoir, and all reservoir sections were sampled during each sampling period.

During periods 2 and 3, setlines were deployed to capture White Sturgeon (see Elliott and Beamesderfer 1990) as documented in Method ID 784 (available at monitoringresources.org). Setlines were deployed on Mondays and allowed to soak for approximately 24 hours. They were then checked and reset on Tuesdays and Wednesdays. All gear was checked and removed from the water on Thursdays. The location for each set was determined by the field staff. Sets would either be reset each time in the same location or moved to a new location within the sampling section. The option to move set locations is to optimize fish catch and to avoid underwater hazards.

For captured White Sturgeon, biological data was collected which included fork length (FL), weight, and disposition (i.e., alive, dead, sacrificed). White Sturgeon were also checked for the presence/absence of scute removal scars along the right and left lateral line. Scute marks are used as secondary marks to indicate the presence of a variety of data parameters, e.g., presence of a Passive Integrated Transponder (PIT) tag, a year mark, or hatchery origin (Method ID 2781). In addition, a small tissue sample was taken from all fish less than 50 cm FL and greater than 136 cm FL for genetic analysis.

Using the data collected, White Sturgeon stock abundance and fish condition characteristics are estimated. Overall abundance (N) of White Sturgeon in the John Day Reservoir in 2022 was estimated using a Schnabel population estimator (Schnabel 1938; Chapman 1952, 1954; Method ID 780). However, the total number of marked fish at the start of given period was adjusted to account for the removals of PIT-tagged fish via the sport and commercial fisheries.

The Schnabel estimator was first used to estimate the abundance of sturgeon in the 70 – 109 and 110 – 137 cm FL size class, which were the groups with the largest number of recaptures. The length-frequency distribution of the 2022 setline catch was then used to apportion the Schnabel population estimate in 1 cm increments. The Schnabel estimate was then expanded to estimate

abundance of the remaining size groups (< 70 cm FL and > 137 cm FL) based on the relative frequency of these size classes in the total 2022 setline catch after adjusting for gear vulnerability. In 2019, a new gear vulnerability curve was derived using empirical data from the last 19 years of recapturing White Sturgeon using a standardized setline methodology (i.e., bait type, hook sizes). Confidence intervals for expanded estimates were calculated using the Delta Method with the variance obtained from the Schnabel estimate (Dorfman 1938).

The relationship between length (L) and weight (W) was described by the exponential function, $W= a*L^b$ (Method ID 5554). The condition of White Sturgeon in the John Day Reservoir was assessed using relative weight (W_r; Method ID 4038). The standard weight equation for White Sturgeon $W_s=2.735\ E\text{-}6*L^{3.232}$, was obtained from Beamesderfer (1993). Annual growth increments (AGI) for White Sturgeon in the John Day Reservoir were obtained from recaptures of PIT tagged fish (Method ID 2782).

Age-0 Indexing

Annual White Sturgeon recruitment is measured each year in October by staff from ODFW, WDFW, and YN. To evaluate recruitment of age-0 White Sturgeon (Method ID 376) sampling was conducted in Bonneville Reservoir from October 3 – 7, The Dalles Reservoir from October 10 – 13, and John Day Reservoir from October 17 – 20 (Figure A-2).

Sinking gill nets were used to capture age-0 White Sturgeon (Method ID 787). A single gill net was deployed at each of the predetermined, standardized index sites with each reservoir. Sampling took place at 13 sites within the Bonneville Reservoir, 12 within The Dalles Reservoir, and 23 within the John Day Reservoir. Sampling methodology and locations were consistent with years past, in some instances alternative index sites were used due to low water levels or if nets were consistently torn-up from sub-surface unknowns. While sampling in Bonneville and The Dalles reservoirs, gear was deployed on Mondays, checked and re-set on Tuesday and Wednesday, and checked and removed from the water on Thursday. To cover the entirety of the John Day Reservoir, gill nets are initially set in the lower reservoir and at mid-week were moved higher in the reservoir and redeployed. Gear is set on Mondays and checked on Tuesday, while only resetting 3 of the 6 nets. On Wednesday the remaining 3 nets are checked and pulled. Nets are then moved upriver, and all 6 nets are deployed at the designated index sites. On Thursday, all nets are check and reset and on Friday all nets are checked and removed from the water.

As nets are being hauled, all fish, as well as debris is removed prior to being reset. Bycatch is enumerated and recorded into the data collection form with the appropriate disposition. Biological data from White Sturgeon captured during age-0 indexing were collected as detailed above in the Stock Assessment section (Method ID 2781). Ages of captured White Sturgeon were estimated following procedures outlined in Beamesderfer et al. (1989; Method ID 2782).

To assess annual recruitment, both the proportion of positive efforts (E_p; proportion of all sets that captured at least one White Sturgeon; Method ID 3783) and the catch-per-unit-effort (CPUE; number of White Sturgeon caught per set; Method ID 5257) were calculated.

RESULTS

Stock Assessment

Effort and Catch

During period 1, Tribal commercial fishers made 591 gill net sets in John Day Reservoir catching a total of 981 White Sturgeon. Of these 584, or 60%, were new fish and given PIT tags. During periods 2 and 3, staff from ODFW, WDFW and YN deployed a total of 525 setline sets catching 1,244 White Sturgeon (Table A-1). Of these, 571, or 46%, were newly PIT tagged. Overall, a total of 2,225 White Sturgeon were captured during all three sampling periods, with 1,155, or 52%, receiving PIT tags.

White Sturgeon were captured in all sampling sections within John Day Reservoir (Figure 1). For periods 2 and 3, there was an average catch rate of 124 White Sturgeon each week. For all sections and sampling weeks combined, CPUE was 2.4 White Sturgeon per setline. In general, catch rates where lowest in the lower portion of the reservoir with the forebay, section 1, having the lowest CPUE of 0.06 (Table A-1).

Size Structure, Growth and Condition

White Sturgeon captured in the John Day Reservoir, using setlines, ranged in length from 51 to 253 cm fork length, with a median length of 121 cm FL. The length distribution of the setline catch was: 0.9% ≤ 70 cm FL, 19% 71-95 cm FL, 13% 96-109 cm FL, 18% 110-137 cm FL, 11% 138-166 cm FL, and 38% greater than 167 cm FL (Table A-2). The 2022 estimated abundance of White Sturgeon ≥ 54 cm FL in John Day Reservoir decreased by 6.5% from the abundance estimated during the 2019 stock assessment. Decreases were observed in five of the six size class groups in which all sturgeon are distributed, the greatest decrease occurred in the smallest size class, fish measuring 54 – 70 cm FL. For this size class, there was a 94% decrease in estimated abundance from the previous stock assessment in 2019. The next greatest decrease occurred in fish measuring 71 – 95 cm FL. This size class experienced a 35 % decrease in estimated abundance.

Growth data were updated to include recoveries of marked White Sturgeon through 2022. Annual growth rates were estimated from recaptures of marked White Sturgeon in the John Day Reservoir (Figure A-3). Only data from White Sturgeon marked and recaptured in the John Day Reservoir and at large for greater than six months were included in this analysis. Estimates of annual growth < 0 and > 15 cm/yr were omitted from analysis. This resulted in 8,351 unique annual growth rates which were then grouped into 5 cm FL bins and the mean growth rate for each bin was estimated (Figure A-4). When examining the mean relative weights of White Sturgeon in John Day Reservoir since 1990, several trends can be seen. Annual growth rates measured in 2022 were relatively similar to recent estimates.

Weights of White Sturgeon in the John Day Reservoir ranged from 1.0 – 155.0 kg, with a median weight of 13.5 kg. The relationship between fork length (L) and weight (W), shown in Figure A-5, was described by the exponential function:

$$W = 3.00\ E - 6 * L^{3.17}$$

Relative weights of White Sturgeon ranged from 37 – 185 kg, with a mean relative weight of 104.7 kg. Mean relative weights, a proxy for body condition, by size class were relatively high (greater than 100) but lower than values from 2019 (Table A-3). Mean relative weights tend to follow an increasing and decreasing pattern over time. Mean relative weight of White Sturgeon less than 70 cm FL had the greatest decrease in 2022 to 90.4, which was also the lowest estimate for the size class in the time series, though data were limiting for the sample ($n < 5$). Data from 2022 appear to be similar to observations in 2016, with the exception of the data limited size class.

Abundance

The estimated abundance of White Sturgeon (≥ 54 cm FL) in the John Day Reservoir during 2022 was 31,454 (95% CI: 25,303 – 42,055). The estimated abundance of White Sturgeon per size class showed a decrease in five of the six size class groups. The greatest decrease occurred in the lowest size class, fish measuring 54 – 70 cm FL (-4,283), followed by fish measuring 71 – 95 cm FL (-3,242). The estimated abundance of legally harvestable White Sturgeon (110 – 137 cm FL) was 5,660 (95% CI: 4,024 – 7,932). The only increase in estimated abundance occurred in the largest size class, growing to 11,888 (Table A-3). Additional size specific abundance estimates of White Sturgeon in the John Day Reservoir from 1999 – 2022 are provided in Figure A-7.

Age-0 Indexing

During age-0 indexing 115 gillnet sets were made. Nets fished for a total of 2,647 hours, with an average soak time of 22.9 hours. In all reservoirs combined, a total of 91 White Sturgeon were capture resulting in an average CPUE of 0.79 sturgeon per set (Table A-4). Of these, 46 were age-0 sturgeon. Based on historic data and aging analysis, White Sturgeon measuring ≤ 30 cm FL are considered to be age-0. The remaining 45 sturgeon are age-1 or older. Captured White Sturgeon range in length from 19.3 to 92 cm FL. The average fork length of age-0 White Sturgeon was 23.7 cm FL (range: 19.3 – 29.0 cm FL; Figure A-6). A total of 43 PIT-tags were applied to captured White Sturgeon across the three reservoirs surveyed. No sturgeon < 40.0 cm FL received a PIT-tag. Two mortalities were encountered in the gill nets, one in Bonneville Reservoir, the other in The Dalles Reservoir.

Bonneville Reservoir recruitment is relatively similar to 2021 (Table A-5). The Dalles saw a slight increase in recruitment but remains low (0.03). For the ninth time in the last ten years, John Day reservoir had a recruitment of 0.

Incidental catch for all species captured during age-0 gillnet sampling were identified and enumerated (Table A-6).

John Day Reservoir

A total of 0 White Sturgeon were captured in 40 net sets in 2022 (Table A-4). Since 2012, there has been only one instance of detectable recruitment in the John Day Reservoir (in 2019), and only five measurable recruitments since 2000 (Table A-5).

The Dalles Reservoir

A total of 9 White Sturgeon were captured in 36 net sets in 2022 (Table A-4). Of these, one was classified as age-0. White Sturgeon, of any size, were captured in 22% of the sets, while age-0 White Sturgeon were captured in 2.7% of net sets. CPUE was 0.25 for all White Sturgeon and 0.03 for age-0 White Sturgeon.

Bonneville Reservoir

In 39 net sets, a total of 83 White Sturgeon were captured in 2022 (Table A-4). Of these 45 were classified as age-0. White Sturgeon, of any size, were captured in 56% of the net sets, while age-0 White Sturgeon 13% of the net sets. CPUE was 2.13 for all White Sturgeon and 1.15 for age-0 White Sturgeon.

DISCUSSION

Stock Assessment

The large decreases in the two smallest size class abundances are linked to the zero to low level of age-0 recruitment that has been observed in John Day Reservoir since 2012 (Table A-5). There has been a trend in fish growing out of these size classes while little to no recruitment has led to less sturgeon growing into these smaller size classes (Figure A-7). Sturgeon measuring within the legal harvestable size slot, 110 – 137 cm FL, saw a decrease of 15%. The current estimated abundance of legally harvestable sturgeon is 5,660. This is 18% of the total estimated abundance of White Sturgeon in the John Day Reservoir. Although this size class has seen a decrease since the 2019 stock assessment, the percentage of sturgeon related to the total estimated abundance has remained consistent (Table A-2). During the previous two stock assessments in the John Day Reservoir (2016 and 2019), legal size sturgeon accounted for 17% and 19% of the set line catch, respectively. Growing white sturgeon can be tracked through size classes over time (Figure A-6), while annual recruitment is demonstrated in Figure A-8. Without any measurable recruitment supplementing the smaller size classes, future stock assessments will reflect the movement of juvenile sturgeon through the smaller size classes and developing into the adult size classes. A potential consequence of this movement will be a downward trend in legally harvestable sturgeon at some point in the future.

The only increase in estimated abundance from the previous 2019 stock assessment occurred in the largest size class, White Sturgeon measuring 167 cm FL and greater. For this size class, a 145 % increase of estimated abundance was observed (n = 11,888). This is a similar increase that was observed during the 2019 survey which measured a 140% increase from the previous study in 2016 (n = 4,858; Table A-2). However, due to relatively low encounter rates for adult White Sturgeon, coupled with the expansion technique used to generate the abundance estimate, this estimate is extremely sensitive to small changes. Even small differences in capture frequency (e.g., ± 1 fish) can have a substantial effect on the subsequent abundance estimate. Therefore, it may be more appropriate to consider trends in abundances for these fish, rather than the point estimate of abundance. Monitoring this trend is becoming increasingly important to ensure an adequate number of broodstock are available to produce measurable age-0 recruitment when conditions are favorable.

Population abundance estimates are an important measurement tool to monitor the overall sustainability of a population, but other factors must be considered when looking at the complete health of a population. Indicators of body condition, such as relative weight, as well as annual growth, provide an indirect means of evaluating ecological relations and the effects of management strategies, especially when making size-specific comparisons within and among populations. This is especially relevant in closed systems such as reservoirs where natural mobility and food availability may be truncated. When examining the mean relative weights of White Sturgeon in John Day Reservoir since 1990, several trends can be seen. Mean relative weights tend to follow an increasing and decreasing pattern over time. This may be the result the changes of food availability over time, or potentially some other unknown environmental factors. It can also be observed that, in general, mean relative weight appears to have improved in recent years exhibiting an upward trend through most size classes (Figure A-5).

Information from recaptured individuals has indicated that somatic growth has increased in recent stock assessments. While mean growth rates over long-term periods are informative, it is known that growth rates of juvenile and sub-adult White Sturgeon from ILCRR can vary substantially over time. Reliability on growth rates for estimating future legal size abundance can lead to an over estimation of fish population within the larger size classes. If recent growth rates are to be used as a factor to estimate population abundance across size classes, only recent data should be used in the matrix growth model to forecast White Sturgeon forward in time. This will be beneficial not to overestimate, and exploit, legal size populations as well as adult size broodstock fish while considering harvest guidelines and future recruitment.

Age-0 Indexing

There was no recruitment detected in the John Day Reservoir, continuing a trend of no to low recruitment since 2000 (Table A-5). Although age-0 recruitment was detected in both the Bonneville and The Dalles reservoirs, E_p and CPUE remain low despite favorable hydrological condition during late spring and early summer months in which spawning takes place. A principal factor related to successful spawning years is adequate dam discharge into the tail races of the dams during the spring months. It has been determined that successful spawning occurs when flows are at a minimum of 250 kcfs (Figure A-8). The spring discharge below McNary Dam in 2022 was above the minimum 250 kcfs threshold necessary for adequate spawning to take place but yielded no measurable age-0 recruitment.

Adaptive Management and Lessons Learned

The Stock Assessment conducted in John Day Reservoir in 2022 has indicated that the overall abundance of White Sturgeon (≥ 54 cm FL) has decreased since the previous stock assessment in 2019. In addition to the overall decrease, there has been a decrease in five of the six size class categories in which White Sturgeon are sub-grouped. There was a significant increase in broodstock sized White Sturgeon, although this number is potentially inflated based on how few sturgeons were captured from this size class and how this estimate is derived in the abundance modeling. The increase in broodstock sized White Sturgeon has potential to provide increased opportunity for age-0 recruitment in future surveys. The lack of detectable age-0 White Sturgeon in the John Day Reservoir in the last ten years is of the utmost concern from a management perspective. With fish growing into new size classes without new fish filling in those vacancies, the availability of legally harvestable sturgeon will decline. For these reasons, harvest guidelines for John Day Reservoir should remain at conservative levels.

In the impounded lower Columbia River, water velocity, which is heavily influenced by dam discharge, appears to be a major component of White Sturgeon spawning success (Parsley 1993; Parsley et al. 1993; Parsley and Beckman 1994; Counihan and Chapman 2018). Data from age-0 indexing, combined with dam discharge data, suggests that higher discharge rates (which create the physical conditions required for successful spawning), generally results in higher levels of age-0 recruitment (Figure A-9). When the average daily discharge rate at McNary Dam during May through July (the primary spawning period for White Sturgeon in the Columbia River)

reaches or exceeds 250 kcfs, there has generally been a detectable level of recruitment in all reservoirs. Although, even with adequate flow and strong numbers of broodstock adults, recent recruitment in John Day Reservoir remains extremely poor. This suggests other factors may be influencing age-0 recruitment in the John Day Reservoir.

Further study of the hydraulic conditions and habitat below McNary Dam may help identify factors that limit White Sturgeon recruitment in years with adequate flow. In 2018, ODFW proceeded with an acoustic telemetry study of adult White Sturgeon below McNary Dam and throughout the John Day Reservoir. The purpose of this study was to track adult movements within the reservoir throughout the year and monitor their movements in and out of the tailrace, especially in late spring when spawning typically occurs.

The results from 2018-2020 telemetry data provided information on within reservoir seasonal movements, as well as sex-specific movements potentially related to spawning events occurring in the McNary Dam tailrace. Receivers were deployed within the McNary Dam tailrace with the intention to collect fine-scale movements, however due to data limitations the desired result was not achieved. In 2022, VR2W acoustic receivers were deployed throughout the John Day Reservoir on US Coast Guard navigational aids to continue to collect seasonal movements. Additional research will include a revised attempt to utilize the dense array for fine-scale modeling to determine precise spawning locations. The telemetry data will be paired with location data collected from stock assessment monitoring to create a holistic understanding of large-scale seasonal movements across different age classes. Habitat models for areas that could potentially be used for spawning or rearing will be generated by utilizing side-scan images and environmental data collection.

Results obtained through this contract will continue to be shared through a variety of inter-agency and stakeholder meetings including annual meetings of the Sturgeon Management Task Force Technical and Policy Committees, U.S. v. Oregon coordination meetings, meetings with commercial and recreational advisor groups, and a wide variety of other *ad hoc* meetings as needed.

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FIGURES

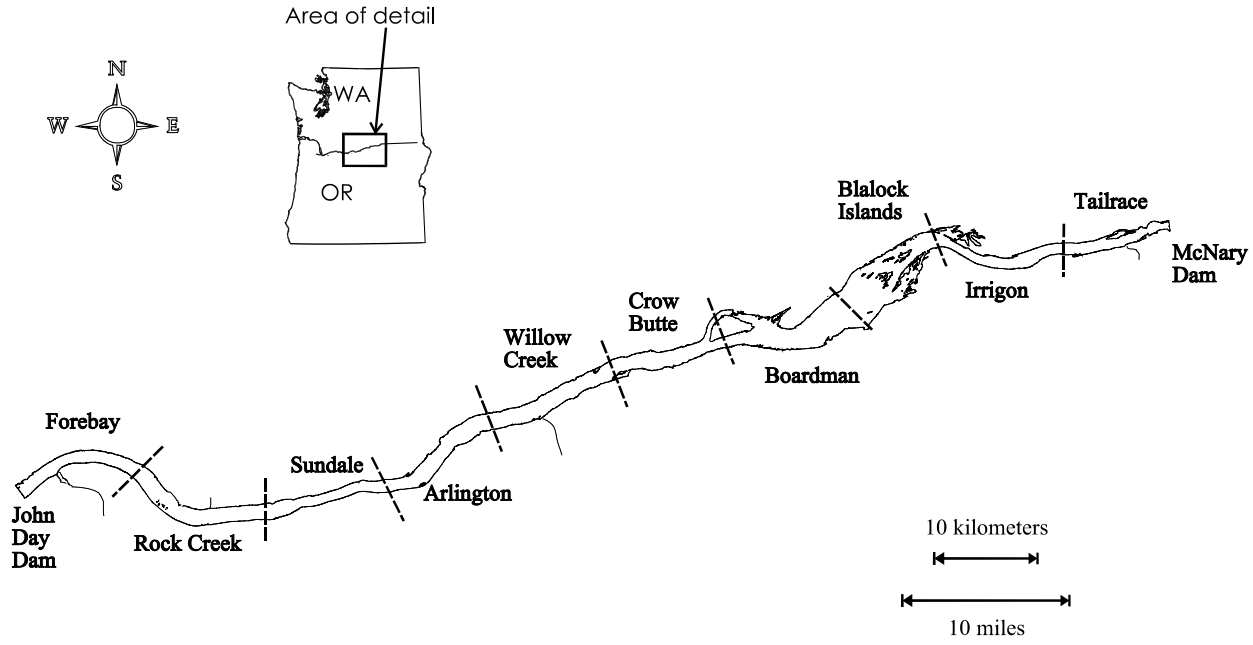

Figure A-1: Map of John Day Reservoir.

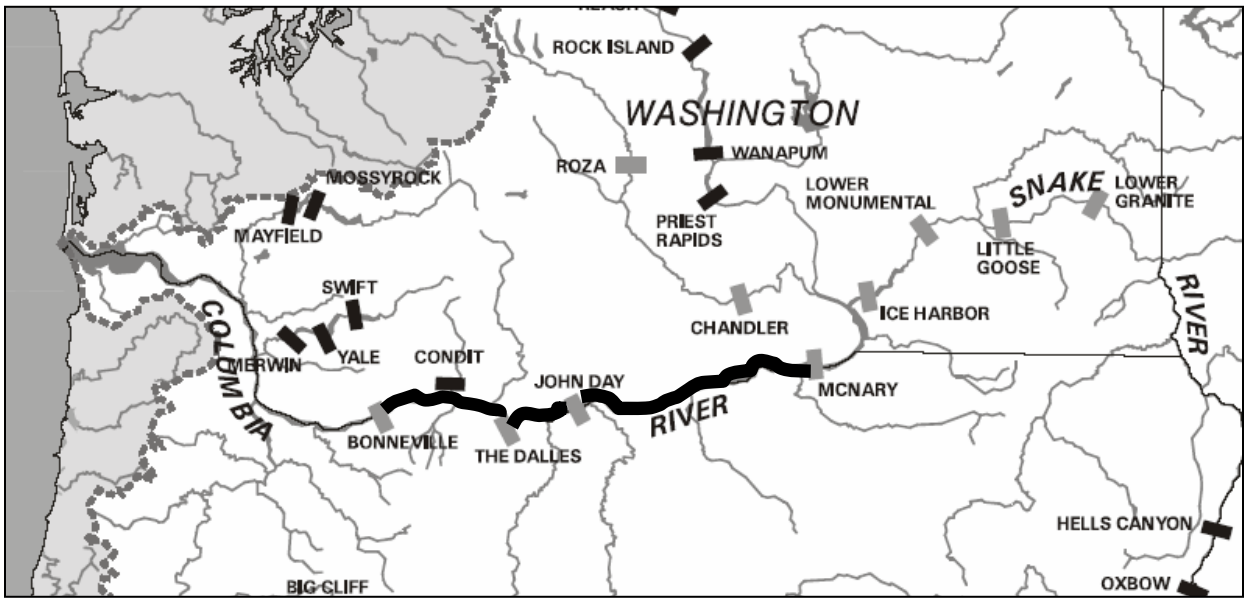

Figure A-2: Map of the mid and lower Columbia River basins with highlighted river sections indicating the reservoirs in which age-0 sampling took place during 2022. Black and grey blocks denote dams in the region.

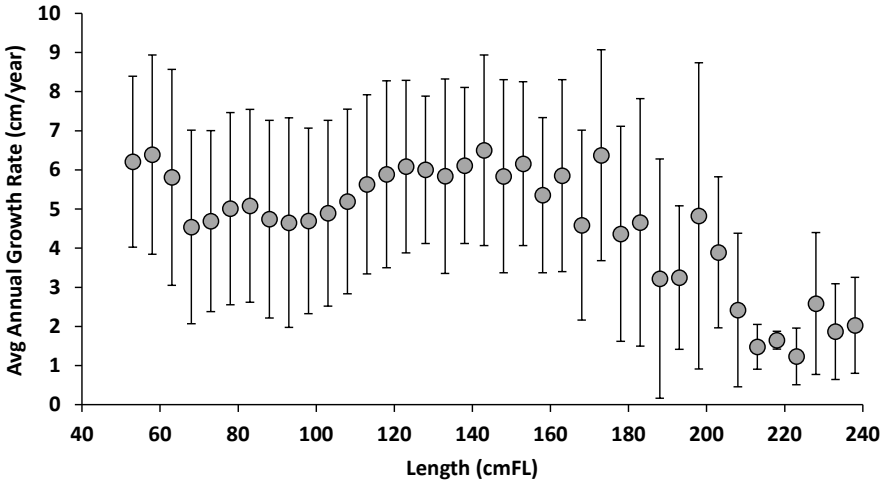

Figure A-3: Mean annual growth rates, by size class, of White Sturgeon from John Day Reservoir, 1990 – 2022. Error bars represent the standard deviation around the mean.

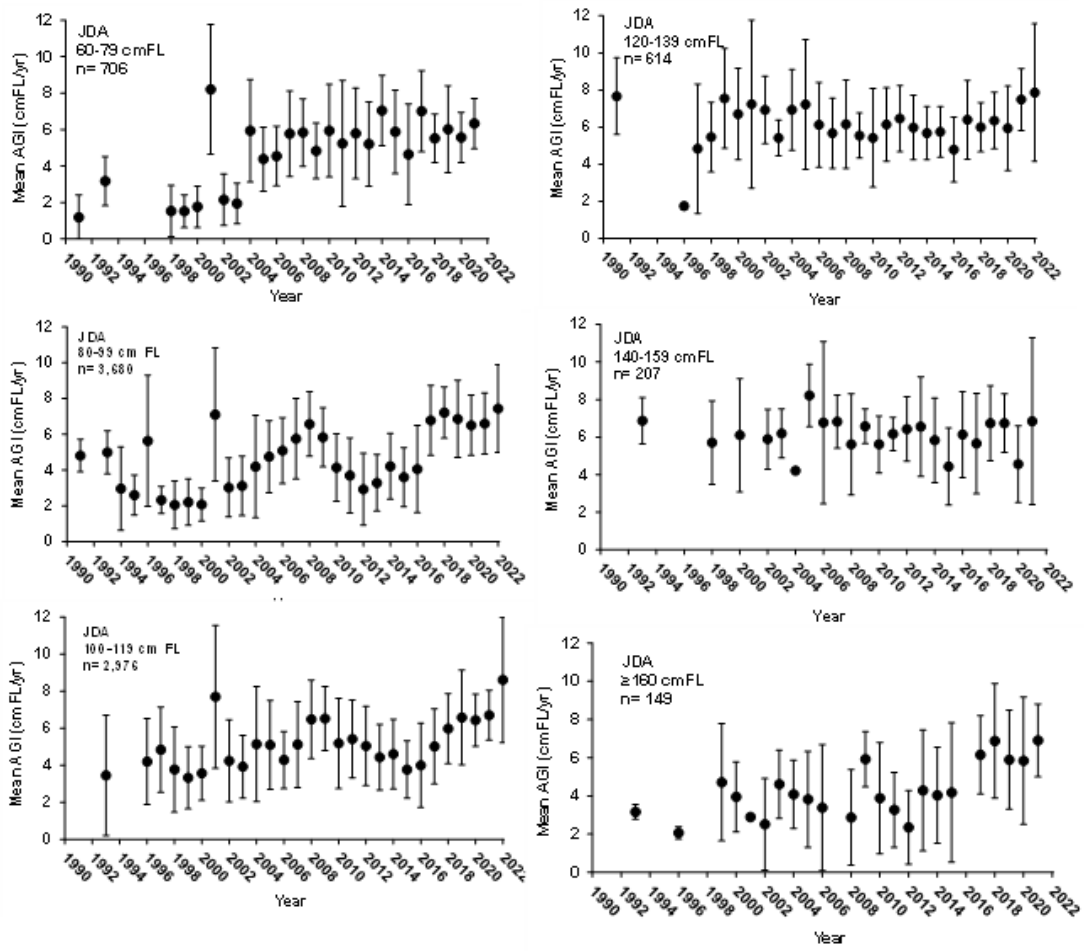

Figure A-4: Mean annual growth rates of White Sturgeon from John Day Reservoir, 1990-2022.

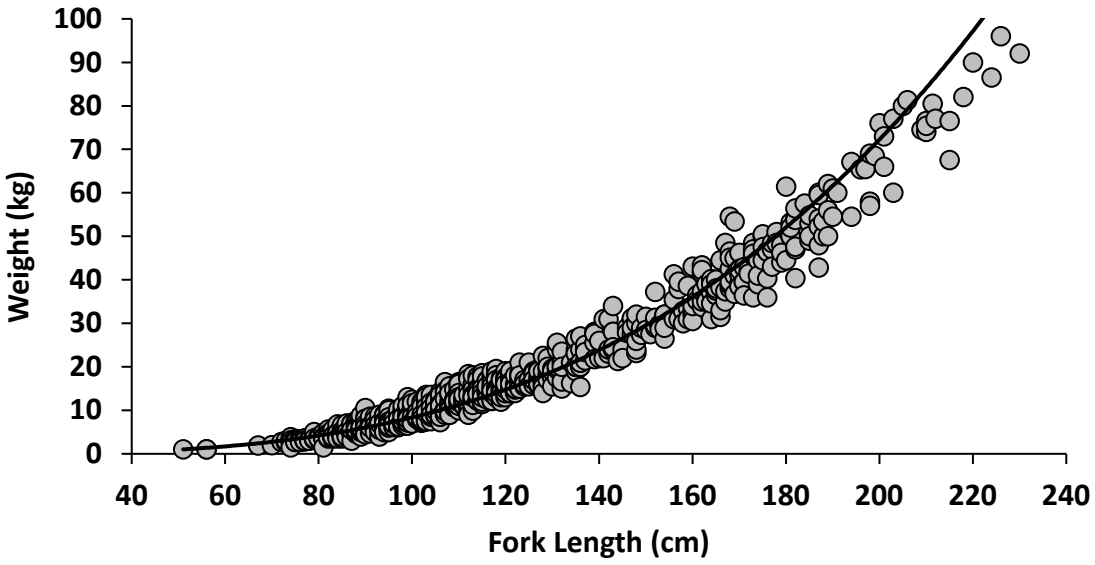

Figure A-5: Length-weight relationship of White Sturgeon captured with setlines during stock assessment sampling in John Day Reservoir. The line represents a best fit curve of the data.

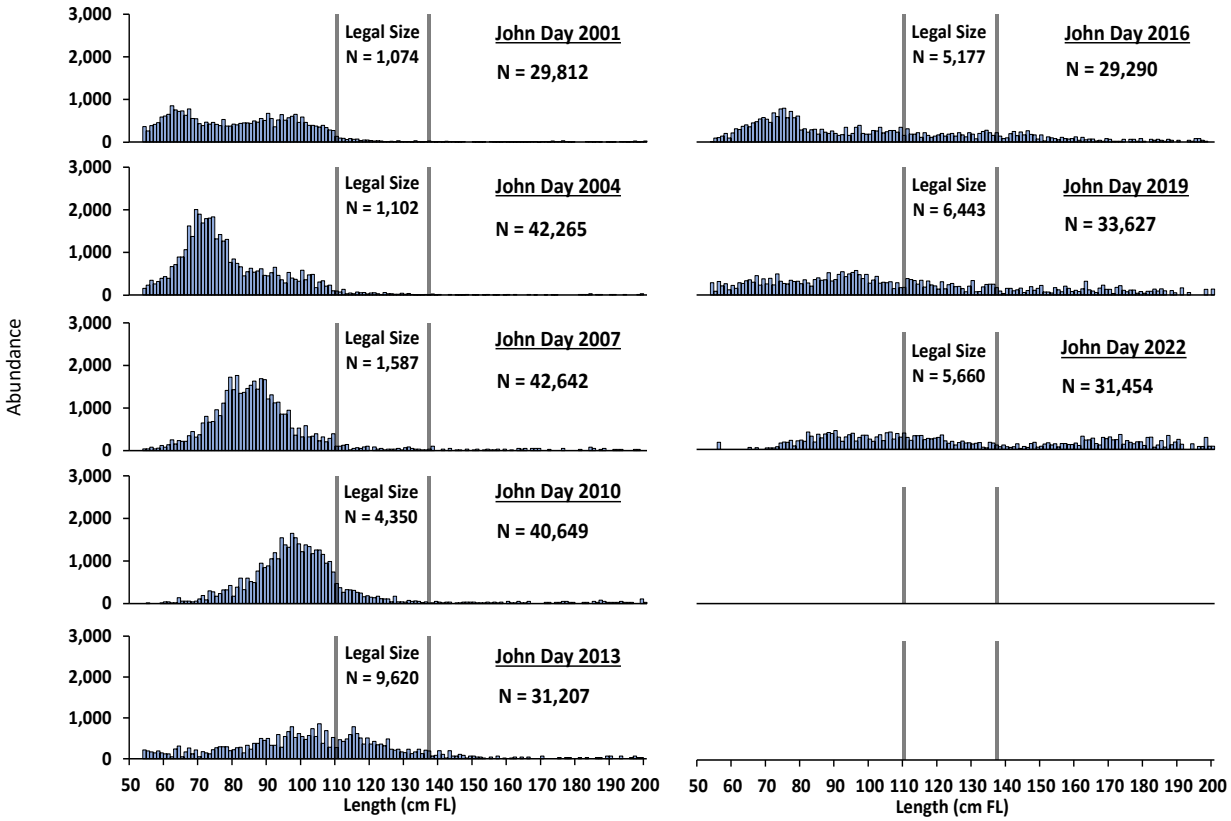

Figure A-6: Estimated abundance of White Sturgeon ≥ 54 cm FL in John Day Reservoir, 2001 – 2022.

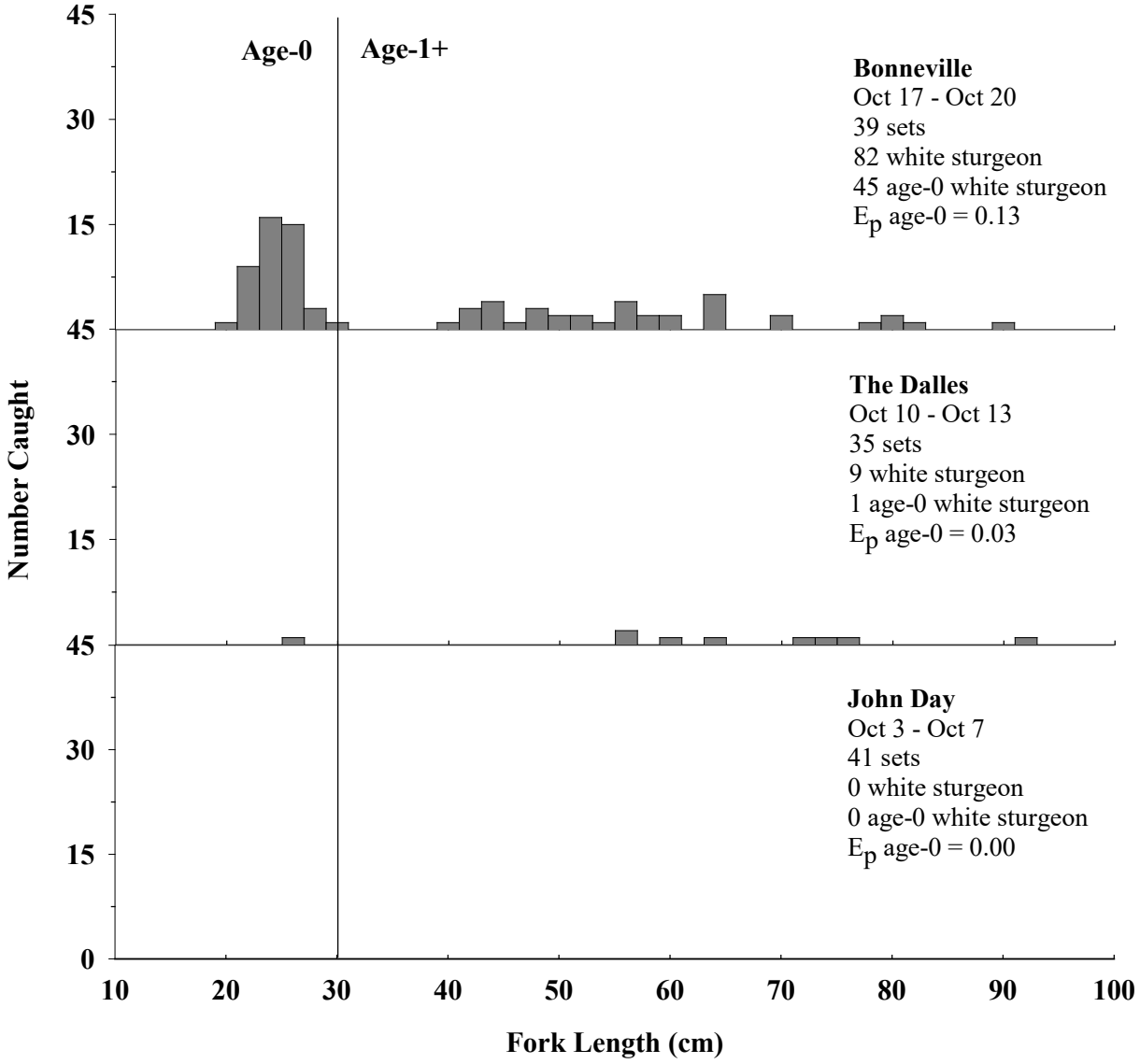

Figure A-7: Length-frequency distribution of White Sturgeon caught in Bonneville, The Dalles, and John Day reservoirs during the 2022 age-0 recruitment indexing surveys.

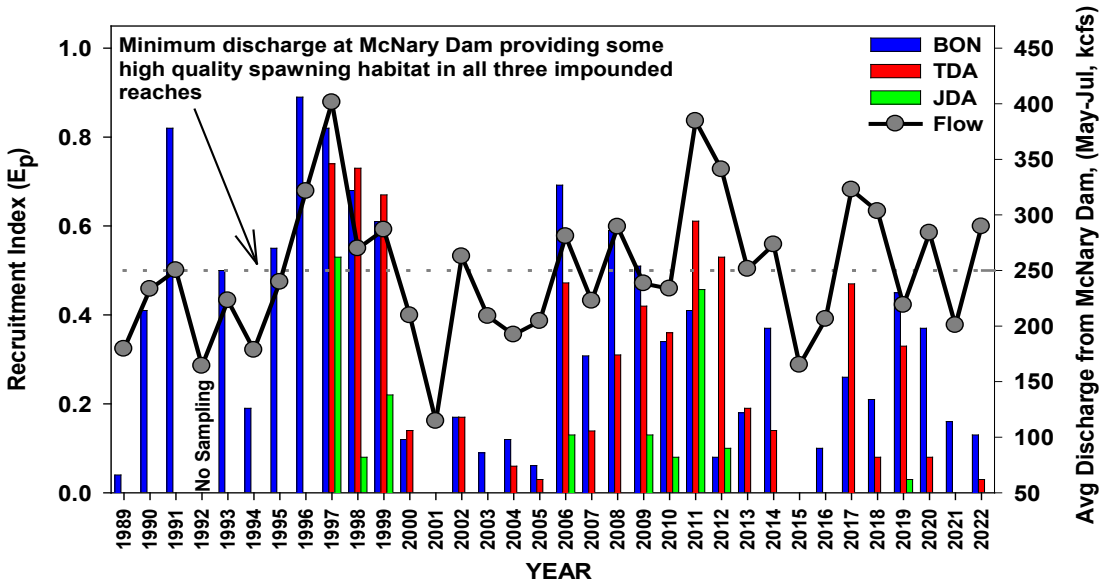

Figure A-8: Annual recruitment of age-0 White Sturgeon and average daily discharge from McNary Dam (May – July), 1989 – 2022. Note: Beginning in 2006, age-0 indexing in Bonneville Reservoir switched from trawl surveys to gillnet surveys.

TABLES

Table A-1: Sampling effort (number of setlines), catch, and catch-per-unit-effort (CPUE), for White Sturgeon in John Day Reservoir by week and sampling section in periods 2 and 3.

Week			Sampling Section										Weekly
			1	2	3	4	5	6	7	8	9	10	Totals
Period 2	23	Effort					30	28					58
		Catch					101	47					148
		CPUE					3.4	1.7					2.6
	24	Effort							26	11			37
		Catch							85	34			119
		CPUE							3.3	3.1			3.2
	25	Effort									28	25	53
		Catch									100	32	132
		CPUE									3.6	1.3	2.5
	26	Effort	18	21									39
		Catch	23	43									66
		CPUE	1.3	2									1.7
	27	Effort			16	32							48
		Catch			33	62							95
		CPUE			2.1	1.9							2
Period 3	31	Effort					28	29					57
		Catch					101	57					158
		CPUE					3.6	2					2.8
	32	Effort							30	20			50
		Catch							143	91			234
		CPUE							4.8	4.55			4.68
	33	Effort									32	27	59
		Catch									139	69	208
		CPUE									4.3	2.6	3.5
	34	Effort	30	33									63
		Catch	7	22									29
		CPUE	0.2	0.7									0.5
	35	Effort			30	31							61
		Catch			25	30							55
		CPUE			0.8	1							0.9
Section Totals		Effort	48	54	46	63	58	57	56	31	60	52	525
		Catch	30	65	58	92	202	104	228	125	239	101	1244
		CPUE	0.6	1.2	1.4	1.5	3.5	1.8	4.1	4	4	1.9	2.4

Table A-2: Abundance estimates by size-class from stock assessments in John Day Reservoir, 1999-2022.

Year	54-70 cm FL (21-27" FL)	71-95 cm FL (28-37" FL)	96-109 cm FL (38-42" FL)	110-137 cm FL (43-54" FL)	138-166 cm FL (55-65" FL)	167+ cm FL (66+" FL)	All (54+" FL)
2001	9,766	11,746	6,154	1,074	213	874	29,827
2004	14,854	21,885	5,022	1,094	185	457	43,498
2007	3,134	30,644	5,782	1,587	635	841	42,622
2010	671	15,073	17,370	4,350	788	2,397	40,649
2013	2,780	7,798	8,192	9,620	1,545	1,272	31,207
2016	5,206	9,655	3,797	5,177	3,430	2,025	29,290
2019[3]	4,565	9,298	4,805	6,443	3,660	4,858	33,627
2022	282	6,056	4,103	5,660	3,465	11,888	31,454
(95% CI's for 2022)				(4,024-7,932)[1]			(25,303-42,055)[2]

[1] 95% CI's from Schnabel estimate
[2] 95% CI's estimated using the Delta Method
[3] In 2019 the function used to correct the raw setline catch for size selectivity was updated

Table A-3: Mean relative weights of White Sturgeon in John Day Reservoir, 1996 – 2022. Shaded values indicate estimates with small sample size (n < 5).

	Mean Relative Weight					
Year	<70 cm FL (<31 in TL)	70-109 cm FL (31-48 in TL)	110-137 cm FL (48-60 in TL)	138-159 cm FL (60-70 in TL)	160 + cm FL (70+ in TL)	All
1996	107.0	104.3	102.7	104.0	91.3	103.8
2001	104.3	94.8	97.4	93.5	94.6	99.3
2004	105.5	103.2	101.3	105.4	97.1	103.4
2007	117.4	103.1	98.1	103.5	90.5	102.7
2010	114.7	104.6	103.8	118.4	98.9	104.7
2013	113.2	103.0	105.7	103.6	103.1	104.8
2016	108.8	105.8	105.0	97.5	91.1	104.6
2019	106.1	116.8	112.5	102.9	95.7	111.6
2022	90.4	106.9	109.9	101.4	92.7	104.7

Table A-4: Effort and catch of White Sturgeon in Columbia River reservoirs during age-0 sampling, October 2022. BON = Bonneville, TDA = The Dalles, and JDA = John Day reservoir.

	Reservoir		
Parameter	BON	TDA	JDA
Gill Net Sets	39	36	40
White Sturgeon Catch (all sizes)	83	9	0
White Sturgeon Catch (Age-0)	32	1	0
White Sturgeon CPUE	2.13	0.25	0
Age-0 White Sturgeon CPUE	0.82	0.03	0
Prop. Of Positive Sets (all sizes)	0.56	0.19	0
Prop. Of Positive Sets (Age-0)	0.13	0.03	0

Table A-5: Annual recruitment index for age-0 White Sturgeon in Columbia and Snake River reservoirs, 1989 – 2022. Recruitment in (Ep) is equal to the proportion of sets capturing at least one age-0 White Sturgeon.

Year	BON[1]	TDA	JDA	MCN	IHA	LGO
1989	0.04					
1990	0.41					
1991	0.82					
1992						
1993	0.50					
1994	0.19					
1995	0.55					
1996	0.89					
1997	0.82	0.74	0.53		0.00	
1998	0.68	0.73	0.08			0.32
1999	0.61	0.67	0.22	0.08	0.03	0.08
2000	0.12	0.14	0.00	0.00	0.00	0.00
2001	0.00	0.00	0.00	0.00	0.00	0.00
2002	0.17	0.17	0.00	0.06	0.00	0.00
2003	0.09	0.00	0.00	0.00	0.00	0.00
2004	0.12	0.06	0.00	0.00	0.00	0.00
2005	0.06	0.03	0.00	0.03	0.00	0.00
2006	0.69	0.47	0.13	0.06		
2007	0.31	0.14	0.00	0.06		
2008	0.59	0.31	0.00	0.06		
2009	0.51	0.42	0.13	0.06		
2010	0.34	0.36	0.08	0.00		
2011	0.41	0.61	0.46	0.26		
2012	0.08	0.53	0.10			
2013	0.18	0.19	0.00			
2014	0.37	0.14	0.00			
2015	0.00	0.00	0.00			
2016	0.10	0.00	0.00			
2017	0.26	0.47	0.00			
2018	0.21	0.08	0.00			
2019	0.45	0.33	0.03			
2020	0.37	0.08	0.00			
2021	0.16	0.00	0.00			
2022	0.13	0.03	0.00			

[1] Index values for BON from 1989-2005 (shaded area) are based on standardized trawl efforts conducted by the USGS. Index values for BON from 2006 to present are based on standardized gillnet efforts.

Table A-6: Catch of non-target species during sampling for age-0 sturgeon in Bonneville, The Dalles, and John Day reservoirs, October 2022. Disposition: 1 = alive and released, 3 = dead or dying at capture. No animals were sacrificed in 2022.

Species	Bonneville			The Dalles			John Day			Combined		
	1	3	Total	1	3	Total	1	3	Total	1	3	Total
American Shad *Alosa sapidissima*	0	3	3	0	0	0	0	10	10	0	13	13
Bullhead Catfish *(Ameiurus spp.)*	1	0	1	1	0	1	0	0	0	2	0	2
Carp *Cyprinus carpio*	1	0	1	0	0	0	0	0	0	1	0	1
Channel Catfish *Ictalurus punctatus*	0	0	0	1	0	1	17	2	19	18	2	21
Chinook Salmon *Oncorhynchus tshawytscha*	0	0	0	1	0	1	0	0	0	1	0	1
Coho Salmon *Oncorhynchus kisutch*	4	4	8	0	0	0	0	0	0	4	4	8
Crappie *(Pomoxis spp.)*	0	0	0	0	1	1	1	0	1	1	1	2
Largescale Sucker *Catostomus macrocheilus*	5	0	5	0	2	2	1	0	1	6	2	8
Northern Pikeminnow *Mylocheilus caurinus*	65	150	215	15	27	42	4	7	11	84	184	268
Peamouth Chub *Mylocheillus caurinus*	64	245	309	2	2	4	0	0	0	66	247	313
Pumkinseed *Lepomis gibbosus*	2	0	2	0	0	0	0	0	0	2	0	2
Smallmouth Bass *Micrpterus dolomieu*	12	2	14	9	3	12	8	4	12	29	9	38
Walleye *Sander vitreus*	0	3	3	0	10	10	11	88	99	11	101	112
Yellow Perch *Perca flavescens*	1	1	2	17	16	33	67	94	161	85	111	196

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WHITE STURGEON MITIGATION AND RESTORATION IN THE COLUMBIA AND SNAKE RIVERS UPSTREAM FROM BONNEVILLE DAM

ANNUAL PROGRESS REPORT
JANUARY – DECEMBER 2022

Report B

Evaluate the success of developing and implementing a management plan to enhance production of white sturgeon in reservoirs between Bonneville and Priest Rapids dams

This report includes: Progress on implementing the fisheries management component of the white sturgeon management plan for the Columbia River between Bonneville and Priest Rapids dams including results of surveying 2022 sport and commercial white sturgeon fisheries.

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January 13, 2023

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ABSTRACT

Staff from Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), and the Columbia Inter-Tribal Fish Commission (CRITFC) monitored sturgeon fisheries between Bonneville Dam and McNary Dam (Zone 6) during 2022. Non-Treaty recreational effort and harvest per unit effort (HPUE) were both relatively high in Bonneville Pool and The Dalles Pool, but not as high as it was in the 2021 season. Effort and HPUE were more in line with recent averages in the John Day Pool. Recreational harvest was 622 (92 % of guideline) fish in Bonneville, 204 (107% of guideline) in The Dalles, and 94 (90% of guideline) in John Day. Treaty commercial harvest was 909 (135% of guideline) in Bonneville, 829 (148% of guideline) in The Dalles, and 187 (107% of guideline) in John Day. Recreational anglers overall had lower effort and corresponding catch rates than in 2021. Lower water temperatures than in previous years may have played a part in contributing to reduced catch rates throughout all three pools when compared to the previous year. John Day Pool effort and harvest decreased compared to 2021, seeing zero fish harvested in February before rebounding in March which coincided with warmer weather and water temperatures at that time.

INTRODUCTION

This annual report describes progress made by the Washington Department of Fish and Wildlife (WDFW) toward completing tasks outlined in the Statement of Work for Bonneville Power Administration Project 1986-050-00, White Sturgeon Mitigation and Restoration in the Columbia River Upstream from Bonneville Dam. The reporting period is from January 1 through December 31, 2022.

Washington Department of Fish and Wildlife (WDFW), in cooperation with Oregon Department of Fish and Wildlife (ODFW), conducted a survey of the 2022 recreational fishery on the Columbia River from Bonneville Dam upstream to McNary Dam (Columbia River commercial management unit Zone 6) to estimate white sturgeon *Acipenser transmontanus* harvest. In cooperation with Columbia Inter-Tribal Fish Commission (CRITFC) we monitored the treaty Indian commercial fisheries in Zone 6.

METHODS

Compliance with the Sturgeon Management Task Force (SMTF) annual harvest guidelines was addressed through in-season management actions. The 2022 sport fishery survey was conducted in Bonneville and The Dalles reservoirs, and that portion of the John Day Reservoir between Crow Butte Park at river kilometer (rkm) 423 (Figure B-1) and McNary Dam at rkm 470, where fishing was concentrated. Methods were similar to those used annually since 1995 (James et al., 1996), and follow accepted procedures documented in Method ID 3784 on monitoringmethods.org (also described in James et.al., 1996).

Angling effort (angler hours) was estimated by counting anglers within representative index areas and expanding those counts to the entire reservoir using an established relationship derived from the 1987 to 1991 aerial counts of anglers within and outside of established index areas

(Hale and James, 1993). Thirty-nine indices of angler effort (17 in Bonneville Reservoir, 10 in The Dalles Reservoir, and 12 in John Day Reservoir) were established at popular fishing locations and vantage points in each reservoir and have remained essentially the same since 1995. One Oregon bank index area (rkm 262) was reassigned upriver and shared by two adjacent locations (rkm 270 and rkm 271) in 2000 to account for a shift in Oregon bank angler effort (James et al., 2001). Another Oregon bank index area (rkm 439) was dropped in 2013 due to closure by the landowner. One Washington bank index area (rkm 270) was dropped in 2005 due to lack of angler use. Subsequently, access to that site has been restricted by the landowner (Burlington Northern Railroad). Harvest estimates were derived for each angling method (bank/boat), reservoir subsection, and weekend/weekday type to account for differential catch and sampling rates. Harvest and angling effort estimates were derived for each day the fisheries were open.

RESULTS

Retention season length in Bonneville Pool in 2022 was 30 days. This was longer than in 2021 (7 days), but still shorter than the 5-year average of 42 days. Season length in The Dalles Pool was 35 days, equal to the 5-year average. There were 3,735 angler trips in Bonneville and 2,954 in The Dalles, all increases relative to 2021 (Figure B-2). Sturgeon sport harvest estimates were 622 (92% of 675 fish guideline) for Bonneville and 204 (107% of 190 fish guideline) for The Dalles (Figure B-2 and Table B-1). Harvest per unit effort (HPUE), defined as the number of legal-size sturgeon harvested per angler trip, was much lower in Bonneville (0.16 vs 0.47) and The Dalles (0.07 vs 0.13) compared to 2021.

At 68 days, the retention season length in John Day Pool was similar to the 5-year average season length of 70 days. The number of estimated angler trips was down from 5,433 in 2021 to 4,182 in 2021. An estimated 94 fish were harvested (90% of 105 fish guideline). The HPUE during 2022 was similar to the HPUE during 2021 (0.022 vs 0.018).

Oversize catch in Bonneville Reservoir was 0.8% of the 2021 oversize abundance estimate (Figure B-4), and 0.6% of total 2022 sturgeon catch. In The Dalles Reservoir, oversize catch was 2.5% of the 2020 oversize abundance estimate, and 7.5% of total 2021 sturgeon catch. In John Day Reservoir, oversize catch was 0.5% of the 2022 oversize abundance estimate, and 26.5% of total 2022 sturgeon catch.

Treaty commercial sturgeon harvests were 909 (134% of 500 fish guideline) for Bonneville Reservoir, 829 (148% of 560 fish guideline) for the Dalles Reservoir, and 187 (89% of 210 fish guideline) for John Day Reservoir (Figure B-2 and Table B-1). An estimated 192 sturgeon were harvested for ceremonial and subsistence use in Bonneville Reservoir, 71 sturgeon harvested in The Dalles Reservoir, and 12 sturgeon harvested in John Day Reservoir (Table B-1).

DISCUSSION/CONCLUSION

The combination of higher effort and HPUE in Bonneville Pool and The Dalles Pool led to the dramatic reduction in season lengths during 2021. Several factors likely led to this combination. Weather during the first week of January 2021 was mild, with warmer daytime temperature and light wind. This potentially encouraged more anglers to come out, especially anglers with smaller boats that typically may not be suited for winter conditions in the Columbia River Gorge. It also may have allowed anglers to stay on the water longer, increasing their chance of catching legal sized fish. The unseasonable warm weather also led to higher than normal water temperatures. It is possible warmer water led to sturgeon being more active and responsive to fishing gear, leading to the high HPUE values. These conditions were not replicated during 2022. Weather was generally colder and windier, with several boat ramps periodically iced over during the first half of January. This led to daily effort that was less than half and HPUE of approximately 25% of what was observed during 2021 in Bonneville Pool. Catches accrued fairly consistently with roughly 40 fish harvested per day on weekends and 10 fish per day on weekdays. In order to be conservative, the states acted to close retention on January 29 with 543 fish harvested, approximately 80% of the 675 fish guideline. After reviewing in-season harvest data, the states adopted two additional retention days during March. Catch on the first day was higher than expected and retention was closed for the season with a final recreational harvest of 622 fish in Bonneville Pool.

In the Dalles Pool, daily effort was the highest all season on opening day, however HPUE was much lower than in 2021 and only 10 fish were estimated to be harvested. After the opener, effort was sharply reduced through January, with cold weather keeping anglers off the water and catch rates low. Conditions got even colder during February, reducing catch rates even further with only 17 fish harvested. As weather warmed during early March, harvest increased with a daily season high of 31 fish harvested on March 12. Harvest remained higher than what was expected, between 11-16 fish per retention day, the final 4 days of the season. Retention was closed on March 21 with a final harvest total of 204 fish, higher than the 190 fish guideline. Without the three days per week season structure, the overage would've certainly been higher.

Fishing in the John Day Pool started off slow with 2-4 fish harvested per week during the month of January. Weather and water temperature were cold and got progressively colder into February. We did not sample a kept fish during the month of February and estimated no harvest for the entire month. On March 1st the weather abruptly warmed leading to snowmelt and higher runoff via John Day Pool tributaries. This led to water level and temperature in the pool rising. Reports by staff monitoring the fishery and anglers indicate that when this occurs, sturgeon become more responsive to recreational fishing gear and tend to congregate on the Oregon side of the pool between Umatilla and Irrigon. This phenomenon appeared to occur again in 2022, leading to high catches during the nine days preceding the March 9, 2022, closure to retention.

Oversize catch in Bonneville Pool remains low, both as a proportion of overall catch and as the estimated proportion of the oversize population abundance. This trend has continued, even as oversize abundance has increased, likely because sublegal and legal-size abundance have outpaced the increase in oversize fish. Oversize catches are more common in The Dalles Pool but are typically less than 5% of total catch and have remained steady in recent years. Similar to

Bonneville, oversize abundance has increased over the previous decade, but so have sublegal and legal-size fish abundances. In the John Day Pool, oversize catches are far more common than the other two pools. The proportion of total catch rose for the second consecutive year during 2022. However, the percentage of oversize sturgeon abundance that was caught was still low, indicating the relative abundance of oversize fish compared to Bonneville and The Dalles. Overall, the proportion of the oversize population handled in recreational fisheries continues to be limited.

ADAPTIVE MANAGEMENT AND LESSONS LEARNED

During 2022, season length in Bonneville Pool was again shorter than the 5-year average and besides one day of retention during March, did not last beyond the month of January. Interest in the Bonneville Pool sturgeon fishery continues to rise, reflected by increasing number of angler trips per day. Anglers have expressed frustration that short season lengths consolidated within short periods of time preclude them from getting a chance to fish. Additionally, forecasting harvest when fishing conditions can change unpredictably makes it difficult to be confident that the fishery will still be open even 2 weeks ahead in time. It also can make staying within harvest guidelines difficult when catch increases more than expected. In order to address these concerns, the states went to a staggered three days per week approach in The Dalles Pool. While fishing was certainly slower than during 2021, this approach may have helped extend the season further into the year. It also may have prevented the harvest guideline from being exceeded even further than it already was by allowing for time to close the fishery prior to the next retention day. After considering these issues and listening to feedback from anglers, the states implemented the same approach in Bonneville Pool for the 2023 fishery.

FIGURES

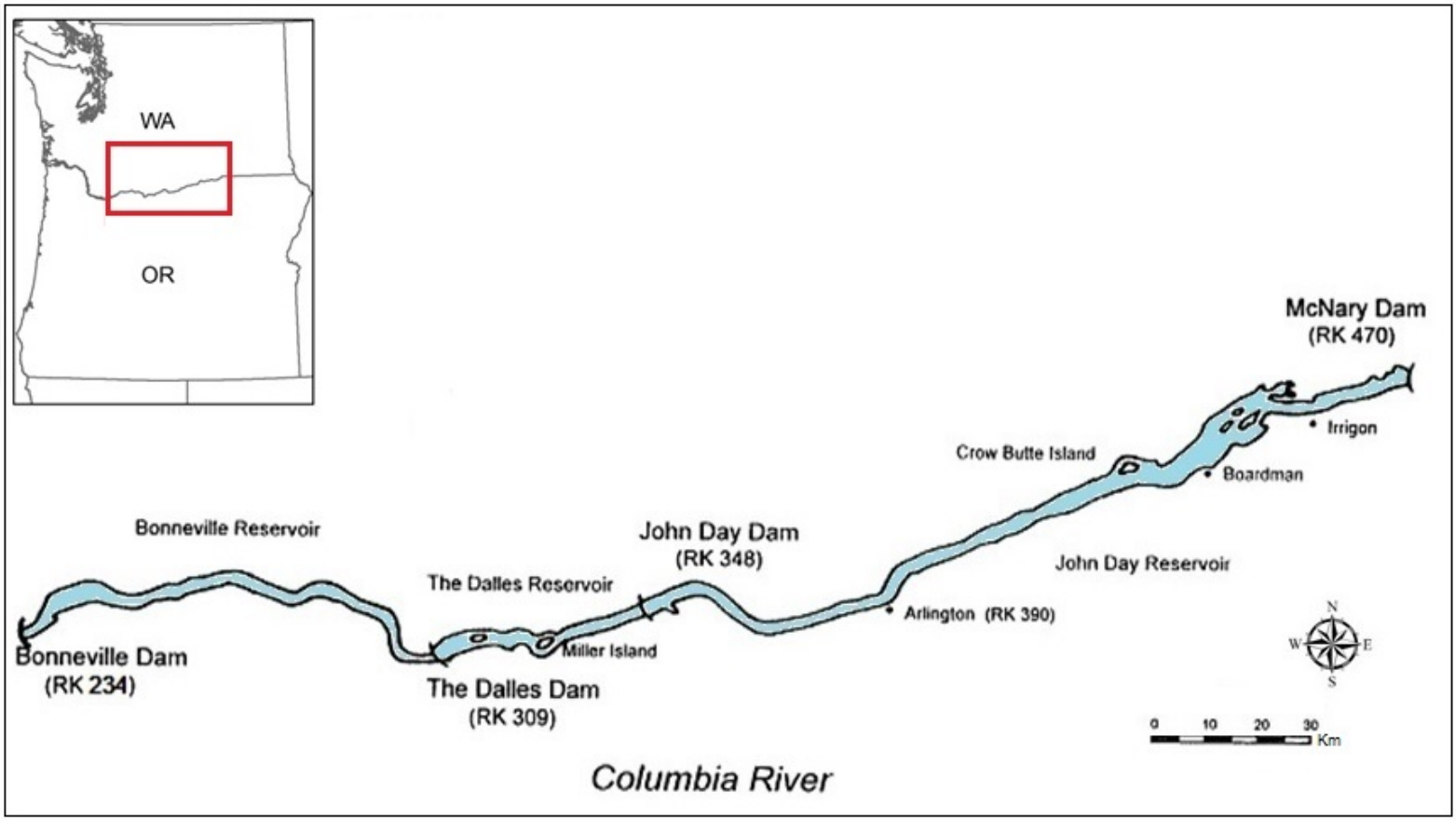

Figure B-2. The recreational fishery survey on the Columbia River occurs throughout Bonneville and The Dalles Reservoirs, and from Crow Butte Island upstream to McNary Dam in John Day Reservoir. Commercial fisheries occur throughout all three reservoirs.

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Figure B-2. Sport effort in terms of total angler trips (blue line) and harvest (red line) compared to harvest guidelines (gray bars) in Zone 6 reservoirs on the Columbia River, 2012–2022.

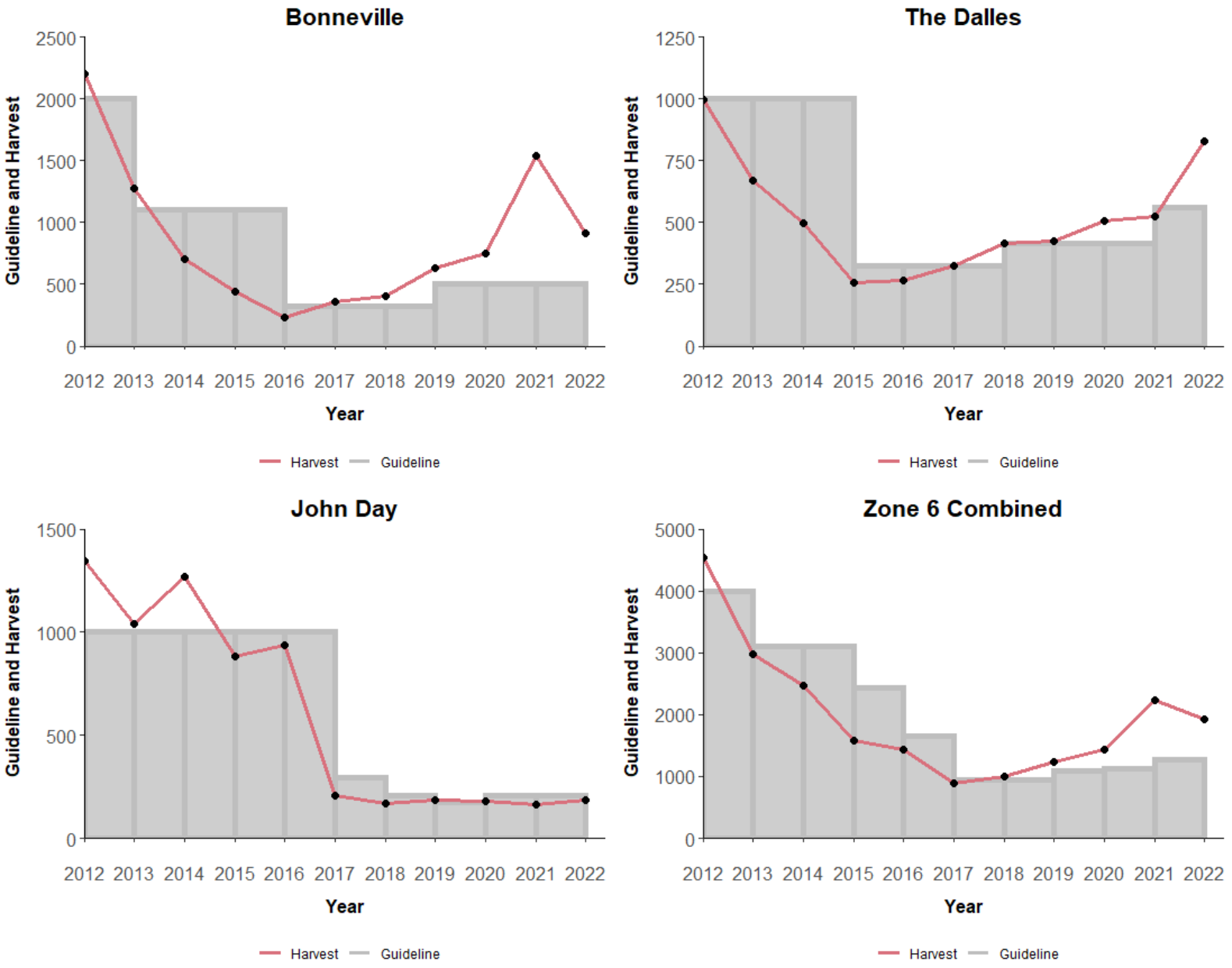

Figure B-3 Commercial harvest (red line) compared to harvest guidelines (gray bars) in Zone 6 reservoirs on the Columbia River, 2012–2022.

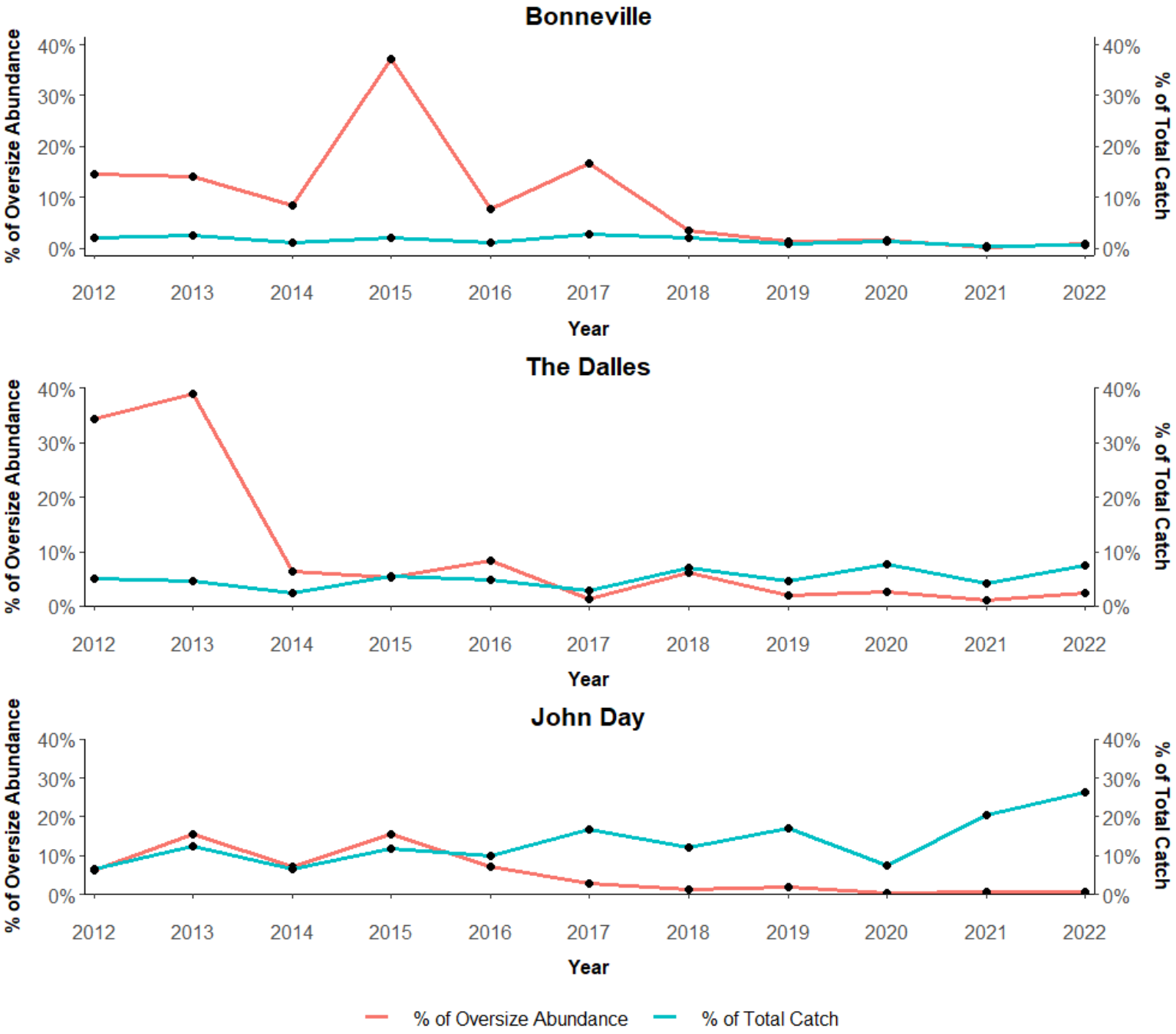

Figure B-4. The reported handling rates of over legal-size sturgeon during retention fishing periods is plotted as a percentage of estimated oversize abundance (blue line, primary y-axis) and as a percentage of total sturgeon catch (red line, secondary y-axis). Spawning sanctuaries were implemented in The Dalles and John Day reservoirs in 2006, in Bonneville Reservoir in 2014, and updated in all three areas in 2019.

TABLES

Table B-1. Zone 6 White Sturgeon Harvest Guidelines and Harvest Estimates, 2011–2022.

Area/Fishery	2011-2012			2013-2014			2015		2016		2017		2018		2019		2020		2021		2022	
	Guide-line	2011 Catch	2012 Catch	Guide-line	2013 Catch	2014 Catch	Guide-line	Catch	Guide-line	Catch[1]	Guide-line	Catch	Guide-line	Catch	Guide-line	Catch	Guide-line	Catch	Guide-line	Catch	Guide-line	Catch[1]
Bonneville Pool																						
Sport	2,000	2,334	1,796	1,100	1,022	877	1,100	874	325	349	325	276	325	452	500	448	500	431	500	655	675	622
Treaty Commercial	2,000	2,089	2,203	1,100	1,277	706	1,100	445	325	236	325	368	325	406	500	630	500	748	500	1,537	675	909
Total	**4,000**	**4,423**	**3,999**	**2,200**	**2,299**	**1,583**	**2,200**	**1,319**	**650**	**585**	**650**	**644**	**650**	**858**	**1,000**	**1,078**	**1,000**	**1,179**	**1,000**	**2,192**	**1,350**	**1,531**
Treaty Subsistence		429	238		194	97		68		45		63		43		90		90		168		192
Abundance estimate			14,212				5,890						8,222									
The Dalles Pool																						
Sport	300	220	279	300	314	121	100	115	100	96	100	84	135	180	135	79	135	205	190	235	190	204
Treaty Commercial	1,000	604	996	1,000	676	496	325	258	325	264	325	326	415	415	415	426	415	508	560	523	560	829
Total	**1,300**	**824**	**1,275**	**1,300**	**990**	**617**	**425**	**373**	**425**	**360**	**425**	**410**	**550**	**595**	**550**	**505**	**550**	**713**	**750**	**758**	**750**	**1,033**
Treaty Subsistence		60	81		72	74		33		33		26		33		34		34		36		71
Abundance estimate	2,730					1,854					3,664						5,650					
John Day Pool																						
Sport	500	533	473	500	509	492	500	532	500	520	105	126	105	81	105	129	105	102	105	98	105	94
Treaty Commercial	1,000	1,208	1,347	1,000	1,050	1,267	1,000	884	1,000	881	295[3]	209	210[3]	166	175[3]	187	175	182	210	166	210	187
Total	**1,500**	**1,741**	**1,820**	**1,500**	**1,559**	**1,759**	**1,500**	**1,416**	**1,500**	**1,401**	**400**	**335**	**315**	**247**	**280**	**316**	**280**	**284**	**315**	**264**	**315**	**281**
Treaty Subsistence		163	128		100	99		107		66		14		13		16		16		29		12
Abundance estimate				9,620					5,177						6,443							
Zone 6 Total																						
Sport	2,800	3,087	2,548	1,900	1,845	1,490	1,700	1,521	925	965	530	486	565	713	740	656	740	738	795	988	970	920
Treaty Commercial	4,000	3,901	4,546	3,100	3,003	2,469	2,425	1,587	1,650	1,381	945	903	950	987	1,090	1,243	1,090	1,438	1,270	2,226	1,445	1,925
Total	**6,800**	**6,988**	**7,094**	**5,000**	**4,848**	**3,959**	**4,125**	**3,108**	**2,575**	**2,346**	**1,475**	**1,389**	**1,515**	**1,700**	**1,830**	**1,899**	**1,830**	**2,176**	**2,065**	**3,214**	**2,415**	**2,845**
Treaty Subsistence		652	447		366	270		208		144		103		89		140		140		233		275
Sport retention periods:																						
Bonneville Pool		1/1-2/18 6/30-7/2 7/7-7/8	1/1-2/1 6/15-16 6/22-23		1/1-2/10 6/14-15 6/21	1/1-19; 2/1-7 2/24-3/9 6/13-14 6/20-21 7/11-12,18-19		1/1-3/7 6/19-21, 26-28 7/3-5		1/1-2/7 6/18		1/1-3/24 6/10, 23		1/1-2/3 6/15		1/1-4/1		1/1-2/1		1/1-1/7		1/1-1/2 3/9
The Dalles Pool		1/1-7/29	1/1-11		1/1-11/11	1/1-7/3		1/1-5/1		1/1-4/29		1/1-3/24		1/1-1 6/15		1/1-6		1/1-2/1		1/1-1/		1/1-3/22, M/W/SA
John Day Pool		1/1-4/9	1/1-5/20		1/1-6/28	1/1-6/1		1/1-6/2		1/1-5/28		1/1-3/29		1/1-2/1		1/1-4/2		1/1-3/9		1/1-3/1		1/1-3/9
Commercial open periods[2]																						
Bonneville Pool		1/1-1/31 S 2/2-3/21 G 6/27-6/30 G 8/1-13 S 10/10-26 S	1/1-1/31 S 2/1-3/6 G		1/1-1/31 S 2/2-3/6 G	1/1-1/31 S 2/2-3/15 G		1/1-1/31 S 2/23-3/21 G		1/1-1/31 S 3/14-3/21 G 8/1-8/13 S 11/14-11/26		1/1-1/31 S 3/6-17 G		1/1-1/31 3/5-14 8/6-25 10/17-3		1/1-1/31 3/1-3/23 G		1/1-1/31 2/27-3/7 G		1/1-1/31 3/1-3/5 G		1/1-1/31 S 3/2-3/4 G
The Dalles Pool		1/1-1/31 S 2/2-3/21 G 6/27-6/30 G 8/1-13 S 10/10-31 S 11/2-12/3 S	1/1-1/31 S 2/1-3/21 G 7/30-8/11 S		1/1-1/31 S 2/2-3/21 G 5/24-6/15 G	1/1-1/31 S 2/2-3/3 G 3/12-22 G 11/25-12/31		1/1-1/31 S 2/2-2/24 G		1/1-1/31 S 2/1-3/12 G 11/7-11/12		1/1-1/31 S 2/1-3/4 G		1/1-1/31 2/1-16 2/22-3/3 3/15-19		1/1-1/31 2/1-2/19 G		1/1-1/31 2/1-2/8 G		1/1-1/31 2/1-2/6 G		1/1-1/31 S 2/1-2/5 G 2/10-2/12 G 2/16-18 G
John Day Pool		1/1-1/31 S 2/2-3/21 G 6/27-6/30 G 8/1-13 S 10/10-31 S	1/1-1/31 S 2/1-3/1 G		1/1-1/31 S 2/1-2/27 G	1/1-1/31 S 2/1-2/26 G		1/1-1/31 S 2/2-2/24 G		1/1-1/31 S 2/1-3/12 G 11/7-11/12		1/1-1/31 S 2/1-3/4 G 8/1-12 S 12/11-30 S		1/1-1/31 2/1-3/3 3/15-24 6/6-15 7/27-8/4		1/1-1/31 2/1-2/27 G 7/26-8/8 S		1/1-1/31 2/1-2/8 G 2/12-2/17 G 2/20-2/24 G		1/1-1/31 2/1-2/6 G 2/12-2/15 G 2/24-2/26 G		1/1-1/31 S 2/1-2/28 G 3/12-3/16 G

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WHITE STURGEON MITIGATION AND RESTORATION IN THE COLUMBIA AND SNAKE RIVERS UPSTREAM FROM BONNEVILLE DAM

ANNUAL PROGRESS REPORT
JANUARY – DECEMBER 2021

Report C

Evaluate the success of developing and implementing a management plan to enhance production of White Sturgeon in reservoirs between Bonneville and Priest Rapids dams

This report includes Results regarding capture and marking efforts in John Day Reservoir for White Sturgeon population-abundance estimates for 2021-22.

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February 26, 2023

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Abstract

Tribal fishers and Yakama Nation fisheries technicians completed John Day Reservoir tagging effort in January 2022. Our sampling is a first step in a two-step coordinated process to document White Sturgeon populations in management Zone 6 (i.e. Bonneville, The Dalles, and John Day Reservoirs). These reservoirs have been monitored cooperatively by tribal and state fishery managers since the mid 1990's (Parker 2015). The winter sampling effort, using highly experienced tribal commercial sturgeon fishers using commercial gear; has been an integral part of the co-management effort to document population changes in the White Sturgeon population structure for John Day and the other Zone 6 reservoirs (i.e., Bonneville and The Dalles Reservoirs) in a cooperative co-management effort with Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife.

Introduction

This annual report documents the efforts of the Columbia River Inter-Tribal Fish Commission (CRITFC) and its subcontractors; the Yakama Nation (YN) and contracted tribal fishers. Jointly, we worked on tasks outlined in the Statement of Work for Bonneville Power Administration Project 1986-050-00, White Sturgeon Mitigation and Restoration in the Columbia and Snake Rivers Upstream from Bonneville Dam. Our winter tagging work was initiated in John Day Reservoir on November 29, 2021, and was completed on January 29, 2022 (Figure C-1). It is common for the winter tagging effort to straddle two separate reporting periods due to the number of weeks necessary to capture and mark the numbers of fish specified in our subcontract.

In addition to winter tagging in John Day Reservoir, YN technicians monitored tribal Zone 6 commercial fisheries, specifically the winter setline (January) and gillnet seasons (February and March). This monitoring effort was a cooperative effort with Washington Department of Fish and Wildlife (WDFW), with the results reported in WDFW's Report B. From May-August of 2022, YN technicians worked cooperatively with WDFW and Oregon Department of Fish and Wildlife (ODFW) stock assessment staff to conduct the summer phase of the population assessment in John Day Reservoir. In October 2022, YN fishery technicians again worked alongside ODFW and WDFW staff to conduct annual young of year White Sturgeon surveys in John Day, The Dalles and Bonneville Reservoirs. In November of 2022, White Sturgeon tagging efforts were initiated in The Dalles Reservoir; results will be reported in the 2024 report.

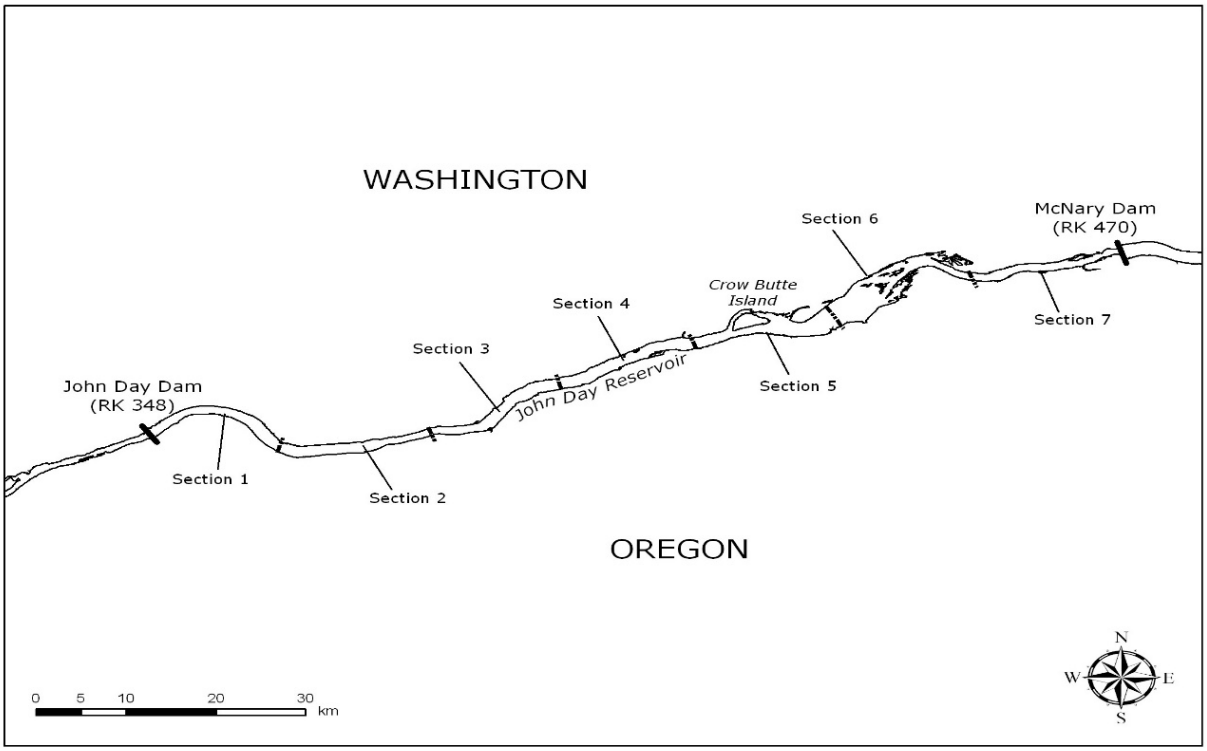

Figure C-1. Map of John Day Reservoir Columbia River with sampled reaches delineated by bars for November 2021 through January 2022 survey period.

Methods

Tagging procedures used are described in (Parker 2015). In addition, the capture and tagging procedures are described in Method ID. 775 (monitoringmethods.org).

Results

John Day Reservoir sampling in the winter of 2021-22 captured in 981 sturgeons in 591 overnight gillnet sets, for a catch per unit effort (CPUE) of 1.7 sturgeons per set (Table C-1). White Sturgeon captured ranged in length from 68 cm fork length (FL) to 289 cm FL, with a mean of 114.7 cm FL. The proportion of sublegal sized (<109 cm FL) catch was 46.3%, the proportion of legal sized catch (109-137 cm FL) was 38.7%, and the proportion of oversize (> 137 cm FL) catch was 15.0 % of the total or 147 fish (Table C-2). We applied PIT tags to 584 sturgeons for an 60.0% overall tagging rate. The winter catch length distribution was very similar to that for the summer tagging catch, with the exception of larger sturgeon in the summer sampling (Figure C-2). The incidental catch total of 99 fish, included seven species, and was dominated by common carp (Table C-3).

Table C-1. Catch, number of sets, and catch per set of White Sturgeon with gillnets in John Day Reservoir for sampling periods in 2000-01, 2003-04, 2006-07, 2009-10, 2012-13, 2015-16, 2018-19, and 2021-22. Unlike prior sample years, in 2021-22 only two fishers were available, hence the proportional reduction in the number of sets and catch of White Sturgeon.

Sampling Period	Sturgeon Catch	No. of Sets	Fish per Set
2000-01	3,014	1,537	1.9
2003-04	2,848	1,408	2.0
2006-07	4,236	804	5.3
2009-10	3,853	554	6.9
2012-13	2,247	855	2.6
2015-16	2,672	1,008	2.6
2018-19	1,926	1,127	1.7
2021-22	981	591	1.7

Table C-2. Proportions of sub-legal sized (<109 cm FL), legal sized (109–137 cm FL), and oversized (>137 cm FL) White Sturgeon captured with gillnets in 2000-01, 2003-04, 2006-07, 2009-10, 2012-13, 2015-16, 2018-19, and 2021-22 sampling periods for John Day reservoir.

Sample Period	Sub-legal Sturgeon	Legal Sturgeon	Over-sized Sturgeon
2000-01	82.0%	15.3%	2.7%
2003-04	90.2%	8.2%	1.6%
2006-07	96.2%	2.8%	1.0%
2009-10	86.2%	13.2%	0.6%
2012-13	60.9%	35.4%	3.7%
2015-16	68.5%	23.8%	7.7%
2018-19	64.8%	19.3%	19.9%
2021-22	46.3%	38.7%	15.0%

Table C-3. Incidentally caught species from the 2021-22 White Sturgeon gillnet sampling effort in John Day Reservoir

Species	Released Alive	Released Dead	Total
American shad *Alosa sapidissima*	0	1	1
northern pikeminnow *Ptychocheilus oregonensis*	1	0	1
channel catfish *Ictalurus punctatus*	19	0	19
walleye *Sander vitreus*	5	1	6
common carp *Cyprinus carpio*	133	4	137
sucker species *Catostomus sp.*	5	0	5

Discussion/Conclusion

In 2021-22, crews caught a total of 981 White Sturgeons in 591 overnight sets, for a CPUE of 1.7 White Sturgeon per set, the same CPUE documented in the 2018-19 sampling effort. These are the lowest CPUE values in the past two plus decades of sampling (Table C-1). The mean FL of White Sturgeon caught in 2021-22 was 114.7, a 14.5 cm increase from mean fork length in our 2015-16 sampling. This increase was corroborated by the substantial decline in the proportion of sublegal sized fish in the catch and the substantial increase in the proportion of legal sized fish in the 2021-22 catch. These shifts in the sublegal and legal sized fish shows the continued movement of the late 1990's recruitment spike continuing to grow into the legal-size category and beyond (Table C-2). In May 2016, thousands of surplus juvenile hatchery White Sturgeon were released in the John Day Reservoir and have since been a contributing element for the increase in the proportion of legal sturgeon, since young of year sampling has shown no recruitment aside from very low levels in 2020 and 2010. The proportion of oversize sturgeon in our catch declined slightly from the 2018-19 sampling, but this decline could be linked to the reduced catch and gear selectivity versus any real change in the numbers of oversize fish (Table C-2).

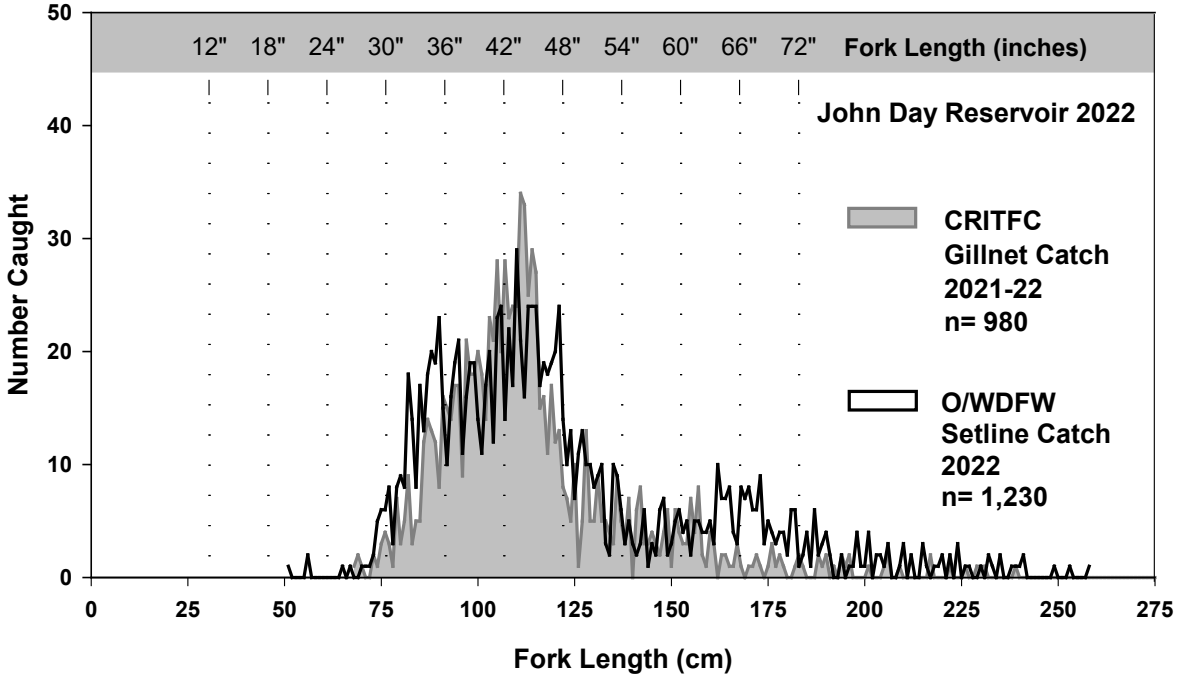

FIGURE C-2. Length frequency differences between White Sturgeon captured during winter tagging in 2021-22 using gillnets and summer 2022 stock assessment using setlines in John Day Reservoir (from 2023 SMTF Technical Report).

Adaptive Management and Lessons Learned

The John Day Reservoir White Sturgeon population appears to be on continued downward decline based upon the proportion of sublegal sized fish and the low CPUE for the last two surveys (TableC-1 and Table C-2). The proportion of legal sized fish increased and oversized fish declined in our 2021-22 catch compared to the 2018-19 catch data (Table C-2). The lack of a positive population change in the John Day reservoir White Sturgeon Population was affirmed by the lack of change in the tribal commercial and sport fishery guidelines at the recent 2023 Sturgeon Management Task Force Meeting by Tribal and State Policy staff.

Acknowledgements

Our sincere appreciation to Yakama Nation fishery technicians, Philip Wahlament and Shane Patterson, CRITFC technician Teddy Walsey, and tribal fishers Alfred M^{c}Conville and Chris Sargeant and their crew members for their dedication that made our tagging efforts a success.

This field season incorporated the use of electronic data forms linked via BlueTooth with new Pit Tag Readers to replace our paper data forms. Michelle Steg-Geltner of Yakama Fisheries and Denise Kesley of CRITFC were the driving force this incredible technological shift in data collection for this project. Additionally, we thank Maria Jim for her data management assistance for the electronic data collection tablets and Megan Begay for her management support on daily operations and coordination. Shelley Tattam of ODFW for her patience and assistance with data proofing of the electronic catch data. We look forward to using this new data collection process in future years.

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