Lower Clark Fork River Population Monitoring
2022 Annual Project Update

Dissolved Gas Supersaturation Control, Mitigation, and Monitoring:
Appendix F5 of the Clark Fork Settlement Agreement

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ABSTRACT

The Idaho Department of Fish and Game monitors the lower Clark Fork River fish assemblage annually with catch per unit effort monitoring (CPUE) conducted every year, and salmonid abundance surveys conducted every three years. The lower Clark Fork River CPUE monitoring was first implemented in 2021 to assess species composition and monitor any relative changes to the fish assemblage. A continuation of this project was conducted in September 2022. Sampling resulted in 17 species and 473 individual fish captured, dominated by Northern Pikeminnow *Ptychocheilus oregonensis* (n = 123), Largescale Sucker *Catostomus macrocheilus* (n = 86), Smallmouth Bass *Micropterus dolomieu* (n = 65), Mountain Whitefish *Prosopium williamsoni* (n = 39), and Brown Trout *Salmo Trutta* (n = 45). Catch rates were similar for most species between the two years; however, catch rates substantially increased for Westslope Cutthroat Trout *Oncorhynchus clarkii lewisi*, Brown Trout *Salmo Trutta*, and Brown Bullhead *Ameiurus nebulosus*, whereas Largemouth Bass *Micropterus salmoides* and Peamouth *Mylocheilus caurinus* substantially decreased. Mountain Whitefish *Prosopium williamsoni* exhibited some of the highest level of body condition, whereas Walleye *Sander vitreus* and Northern Pikeminnow *Ptychocheilus oregonensis* exhibited the lowest condition (Table 1). Most salmonids exceeded 200 mm total length. There was a substantial reduction in the proportion of fish less than 200 mm total length for both Largescale Suckers and Northern Pikeminnow between sampling events.

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INTRODUCTION

Cabinet Gorge Dam is located on the lower Clark Fork River just inside the Idaho border and approximately 32 km downstream of Noxon Rapids Dam in Montana (Figure 1). An agreement reached between Avista (formerly Washington Water Power) and the Idaho Department of Fish and Game (IDFG) in 1973 provided a 3,000 cubic feet per second (cfs) minimum flow below Cabinet Gorge Dam. The agreement was based on field assessments of the river at varying flows, electrical generating requirements, a review of historic low-flow records, and a recommendation for a minimum flow of the same amount (i.e., 3,000 cfs) made by the U.S. Fish and Wildlife Service. However, minimum flow in the lower Clark Fork River below Cabinet Gorge Dam was still one issue of concern to the local stakeholders involved in a collaborative relicensing process conducted by Avista for Cabinet Gorge and Noxon Rapids dams. Avista applied for relicensing of these two hydroelectric facilities on the Clark Fork River in Idaho and Montana in 1999, and the Clark Fork Settlement Agreement was the product of the collaborative relicensing process (Avista 1999). A new minimum flow was negotiated for Cabinet Gorge Dam, which increased the base flow from 3,000 cfs to 5,000 cfs beginning March 1, 1999 (Avista 2001). The objective of the increased minimum flow was to increase the amount of permanently wetted river habitat to benefit the aquatic resources of the lower Clark Fork River. More specifically, the objectives were to reduce the range of depth and velocity fluctuations in the river, reduce the varial zone, reduce depositional bar dewatering to increase stability of shoreline rearing areas for fish, and enhance macroinvertebrate production. Photo documentation was used to estimate the minimum flow needed to provide a meaningful increase in permanently wetted perimeter of the lower Clark Fork River (Beak Consultants, Inc. 1997).

To assess the effectiveness of changes in minimum flow and channel alteration, a 10-year monitoring program was conducted from 1999 through 2008. Fish populations were monitored in a 6.6 km reach of the lower Clark Fork River. Targeted species in the monitoring program included Brown Trout *Salmo trutta* (BRN), Mountain Whitefish *Prosopium williamsoni* (MWF), Rainbow Trout *Oncorhynchus mykiss* (RBT), Westslope Cutthroat Trout *O. clarkii lewisi* (WCT), and Rainbow Trout x Westslope Cutthroat Trout hybrids (WRHY). Assessment focused on monitoring changes in abundance, size structure, and body condition of fish populations in the affected area. Abundance of target species was estimated during annual monitoring efforts using mark-recapture techniques. Results over this 10-year period suggested abundance, size structure, and body condition of fish populations in the lower Clark Fork River were largely unchanged following increases in minimum flow below Cabinet Gorge Dam (Ryan and Jakubowski 2012). No substantial increases in salmonid abundance were noted after this period, and it was agreed to eventually return to 3,000 cfs minimum flow except for September 15th through October 31st when minimum flows are increased to 5,000 cfs to improve conditions for downstream migrating juvenile Bull Trout. This agreement was finalized in 2017 and implementation began in 2018 (Avista 2017).

Beginning in 2018, the abundance monitoring project for species of concern (i.e., BRN, RBT, WCT, and MWF) was transitioned to a 3-year rotation sampling protocol (Ransom

et al. 2022). However, in an attempt to expand data collection to a more comprehensive species distribution without increasing personnel needs, an exploratory catch per unit effort (CPUE) monitoring project was initiated in September of 2021. This project was then replicated yearly basis to monitor the composition and distribution of the entire fish community within the lower Clark Fork River (Ransom et al. 2022). This survey was continued in September of 2022.

STUDY AREA

The Clark Fork River is the largest tributary to Lake Pend Oreille, contributing an estimated 92% of the annual inflow (Frenzel 1991) and draining approximately 59,324 km^2 of western Montana (Lee and Lunetta 1990). Four tributaries enter the Clark Fork River downstream of Cabinet Gorge Dam (Twin, Mosquito, Lightning, and Johnson creeks; Figure 1). Peak flows in the Clark Fork River typically occur as a result of snow melt in May or June, but occasionally in April or July (PBTAT 1998). Physical habitat in the Clark Fork River below Cabinet Gorge Dam can be characterized as primarily low gradient laminar flow, with three major riffles and several deep pools (WWP 1995). Riffles are located near the mouths of Twin and Lightning creeks, as well as at Foster Bar side-channel. The study area encompasses approximately 6.6 km of river habitat from the U.S. Geological Survey gauging station below Cabinet Gorge Dam downstream to the inlet of Foster Bar side-channel (approximately river km 6.5–13.5; Figure 1).

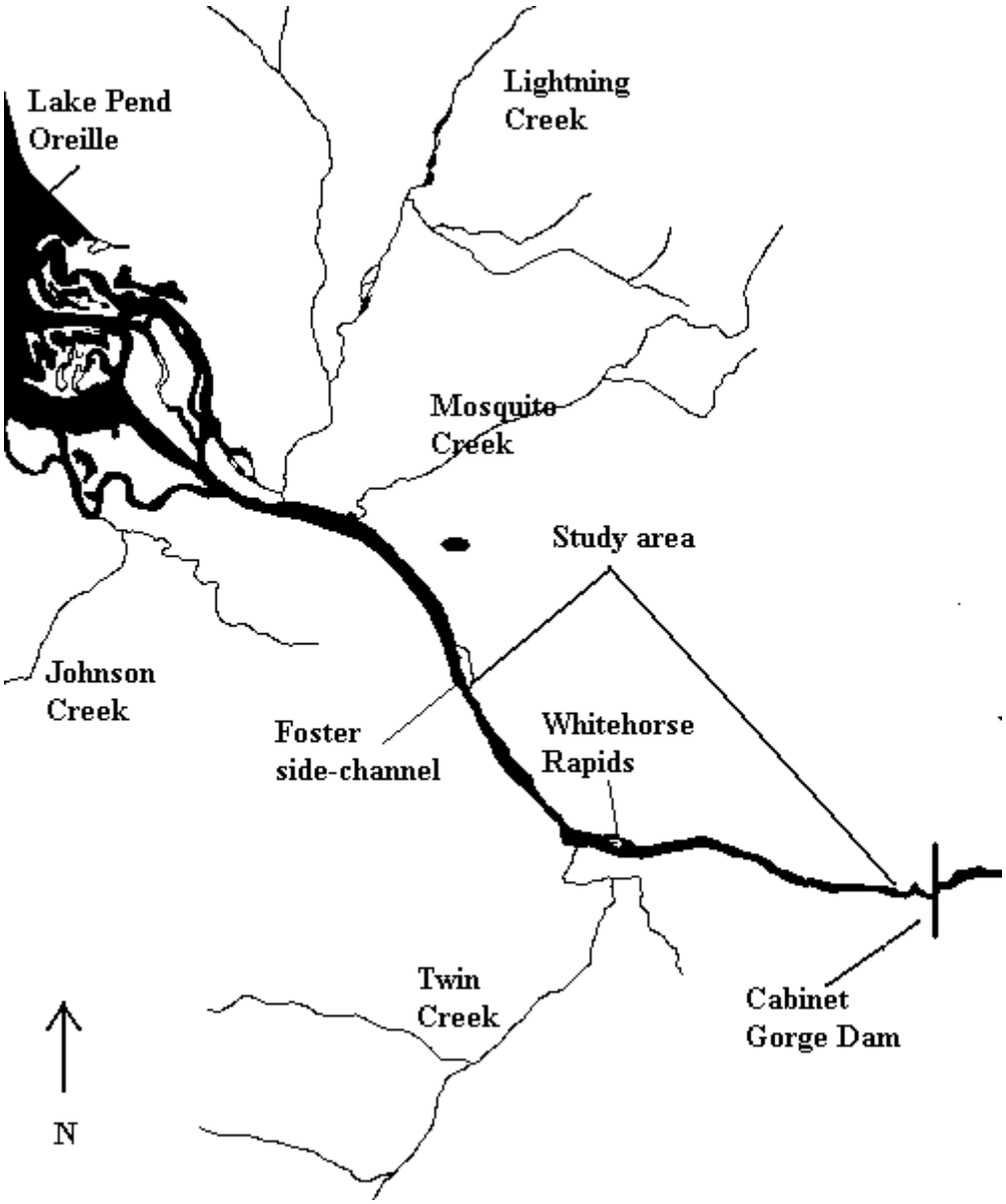

Figure 1. Fishery evaluation study area on the lower Clark Fork River, a major tributary to Lake Pend Oreille.

METHODS

Sampling was conducted at eight 700-m reaches that were selected within the existing mark-recapture reach on the Clark Fork River and attempted to cover a representative distribution of available habitat types (Figures 1 and 2). Boat-mounted, boom-type electrofishing equipment was used to sample fish at night. A Midwest Infinity rectifying unit was set to 60 Hz, 20% duty cycle, 300 volts, and 8–10 amps. The electrofishing boat drifted in fast flow areas or motored downstream slowly in areas of very slow flow, parallel with the shoreline. While electrofishing, we attempted to keep the anode closest to shore in approximately 0.6 m of water depth. Total effort (time) from each

electrofishing reach was recorded and used to estimate number of fish per minute sampled (i.e., catch per unit effort [CPUE]).

All fish were captured and identified to species, enumerated, measured for total length (TL; mm), weight (g), and non-lethal ageing structures were taken (scales and fin rays). Captured fish were anesthetized with AQUI-S®20E for processing. Characteristics used in identifying Rainbow Trout x Westslope Cutthroat Trout hybrids included throat slashes typically of light intensity or broken in form and exhibiting heavy spotting below the lateral line and toward the anterior end of the fish (Bouwens and Jakubowski 2016). In addition, all captured Walleye *Sander vitreous* and Northern Pike *Esox lucius* were euthanized in accordance with current predator suppression efforts (Bouwens et al. 2023). Body condition of species was investigated using relative weight (W_r; Blackwell et al. 2000) when regression equations were available.

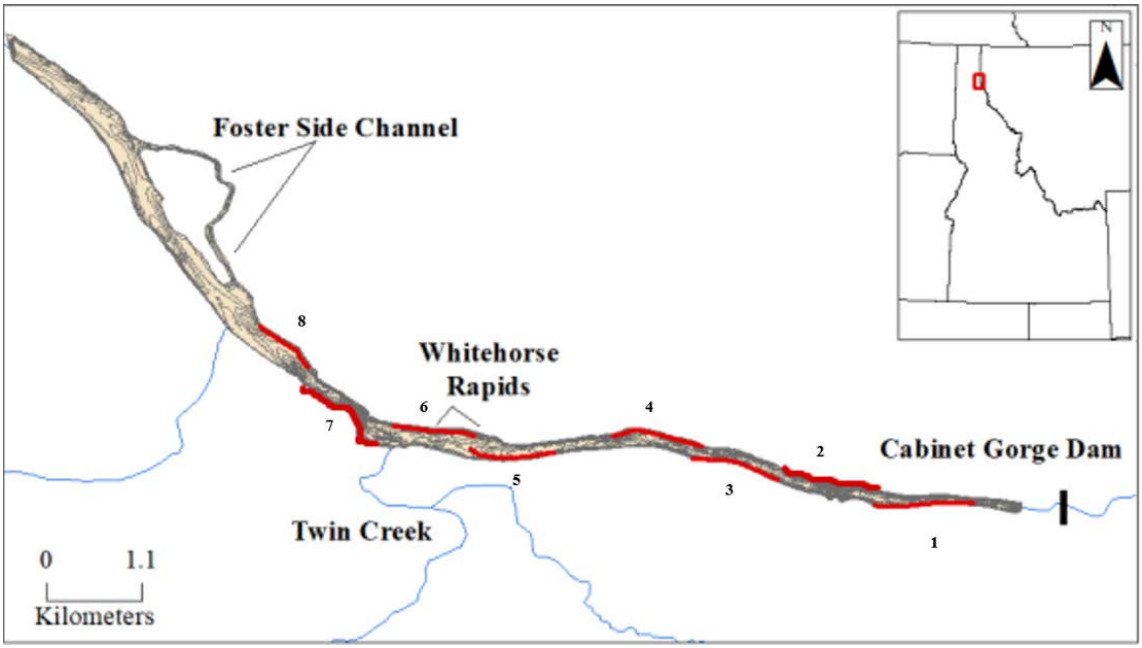

Figure 2. Map of the lower Clark Fork River surveyed in 2022 with specific sampling reaches identified in red and enumerated.

RESULTS AND DISCUSSION

Catch per unit effort sampling occurred September 12–15, 2022 during which 17 species, including hybrids, were captured. A total of 473 individual fish were caught, the majority of which were Northern Pikeminnow *Ptychocheilus oregonensis*, Largescale Sucker *Catostomus macrocheilus*, Smallmouth Bass *Micropterus dolomieu*, Mountain Whitefish, and Brown Trout (Table 1). For most species a wide range of size classes were observed, with the largest fish sampled being a 696 mm Walleye (Table 1). Mountain Whitefish exhibited some of the highest level of body condition, whereas Walleye and Northern Pikeminnow *Ptychocheilus oregonensis* exhibited the lowest condition (Table 1). The overall size of fish sampled was similar between the two years (Figures 4–11); however, there was a substantial reduction in the proportion of fish less than 200 mm TL for both Largescale Suckers and Northern Pikeminnow (Figures 5 and 6). Additionally, the overall TL distribution for Walleye shifted to smaller fish (Figure 11). Due to the relatively new implementation of this project, only rudimentary comparisons between years could be conducted. Most species had similar catch rates between the two years; however, Westslope Cutthroat Trout, Brown Trout, and Brown Bullhead *Ameiurus nebulosus* had a substantial increase, whereas Largemouth Bass *Micropterus salmoides* and Peamouth *Mylocheilus caurinus* had a substantial decrease in catch rates (Figure 3, Table 2).

Overall, the CPUE monitoring documented most species known to exist within the lower Clark Fork River and provided updated metrics for relative abundances. The sampling was also effective at capturing individuals across a broad size range; however, we observed that most juvenile fish were residing within large patches of aquatic macrophytes. Interestingly, trout and other native fishes appeared to have below average body condition compared to their respective species distribution. It should be noted that sample sizes were low for some species and may not fully represent the population.

Table 1. Summary statistics for each species captured during September 2022 CPUE sampling. Variables reported are number captured (n), min total length (mm), max total length (mm), mean total length (mm), standard deviation of total length (SD TL; mm), mean relative weight (W_r), and standard deviation of the relative weight (SD *Wr*). A dash signifies the species does not have a defined relative weight equation and NA indicates a lack of adequate weight data (n < 10) to determine relative weight.

	n	Min TL	Max TL	Mean TL	SD TL	*Wr*	SD *Wr*
Northern Pikeminnow	123	115	518	257	73.04	72	9
Largescale Sucker	86	128	592	475	96.39	91	10
Smallmouth Bass	65	60	386	212	75.42	98	18
Brown Trout	45	186	588	323	100.33	93	22
Mountain Whitefish	39	227	420	342	63.39	98	14
Rainbow Trout	30	121	650	366	103.78	-*	-
Westslope Cutthroat Trout	20	250	459	346	64.50	92	21
Yellow Perch *Perca flavescens*	17	106	186	140	22.47	91	8
Walleye	15	177	696	311	160.20	73	9
Westslope x Rainbow Hybrid	15	244	463	366	74.21	-	-
Peamouth	7	218	362	311	58.02	-	-
Brown Bullhead	3	115	149	132	17.00	-	-
Largemouth Bass	2	89	109	99	14.14	NA	NA
Northern Pike	2	493	733	613	169.71	NA	NA
Redside Shiner *Richardsonius balteatus*	2	81	85	83	2.83	-	-
Bull Trout *Salvelinus confluentus*	1	586	586	586	-	-	-
Sculpin spp. *Cottus spp.*	1	55	55	55	-	-	-

* The sample contained Gerard strain Rainbow Trout and no appropriate relative weight curve was available.

Table 2. Summary statistics for the 2022 Clark Fork River CPUE sampling efforts. Variables reported are number captured (n), seconds shocked, CPUE, and percent change from 2021 (Ransom et al. 2022).

Species	n	Seconds	CPUE	% Change
Northern Pikeminnow	123	12014	0.614	28
Largescale Sucker	86	12014	0.429	-19
Smallmouth Bass	65	12014	0.325	-44
Brown Trout	45	12014	0.225	63
Mountain Whitefish	39	12014	0.195	-19
Rainbow Trout	30	12014	0.15	14
Westslope Cutthroat Trout	20	12014	0.1	376
Yellow Perch	17	12014	0.085	-35
Walleye	15	12014	0.075	-10
Westslope x Rainbow Hybrid	15	12014	0.075	-10
Peamouth	7	12014	0.02	-50
Brown Bullhead	3	12014	0.015	114
Largemouth Bass	2	12014	0.01	-94
Northern Pike	2	12014	0.01	-29
Redside Shiner	2	12014	0.01	43
Bull Trout	1	12014	0.005	-
Sculpin spp.	1	12014	0.005	-

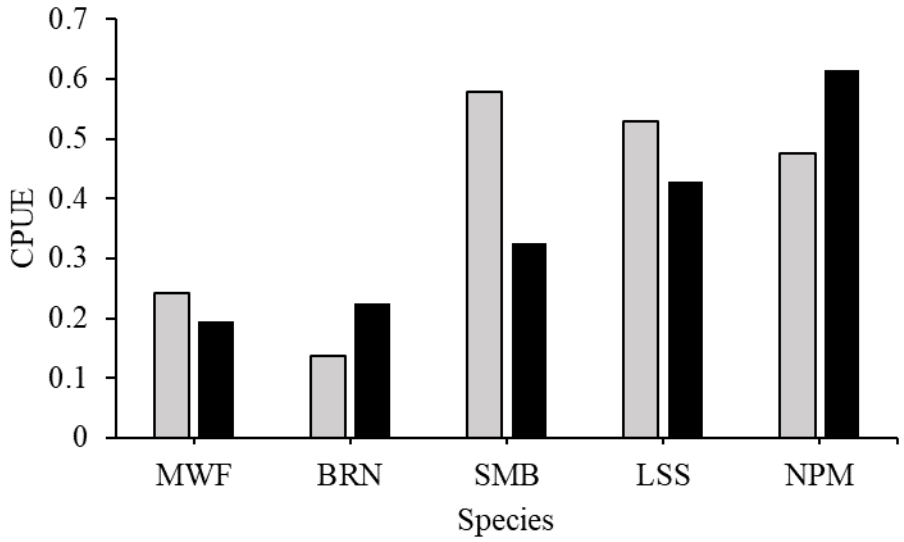

Figure 3. CPUE trends for 2021 (Ransom et al. 2022; light gray) and 2022 (black) for the five most commonly captured species (Mountain Whitefish [MWF], Brown Trout [BRN], Smallmouth Bass [SMB], Largescale Sucker [LSS], and Northern Pikeminnow [NPM]) captured during the lower Clark Fork River CPUE sampling.

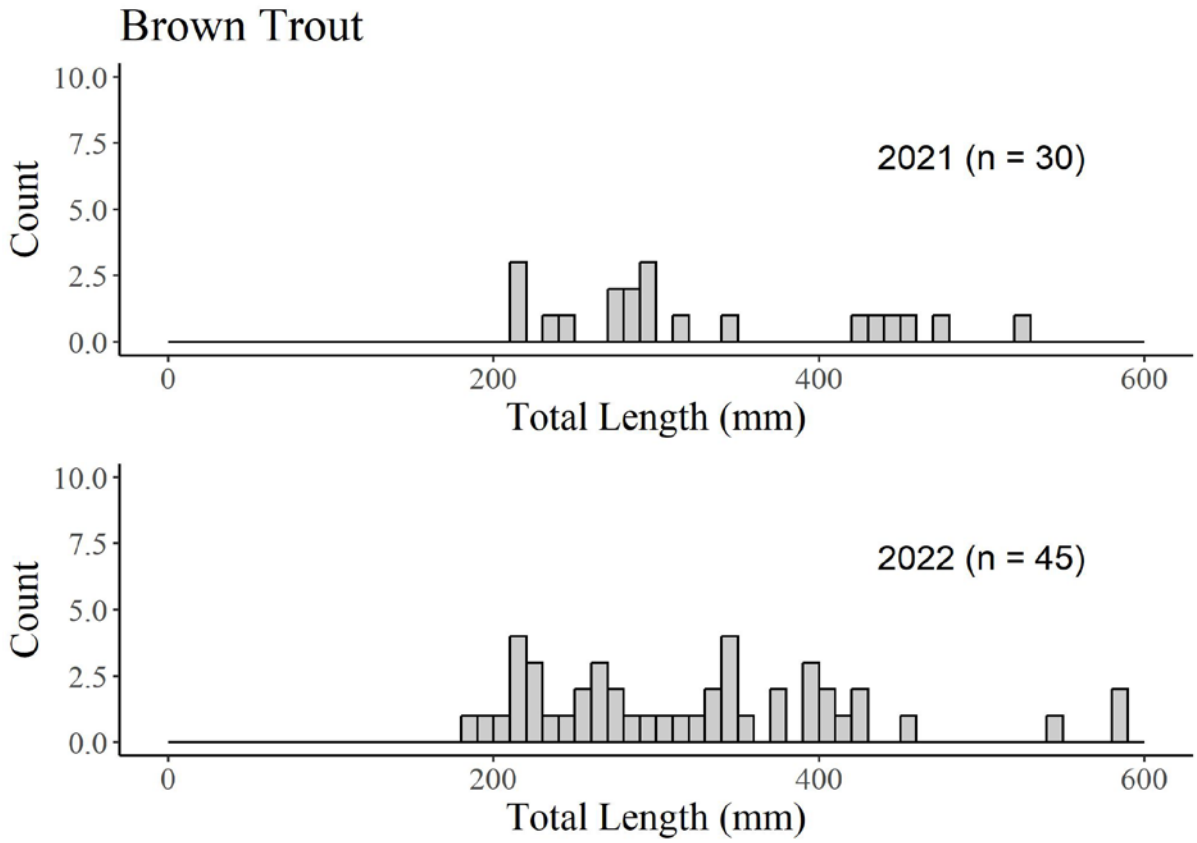

Figure 4. Length-frequency histogram for Brown Trout captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

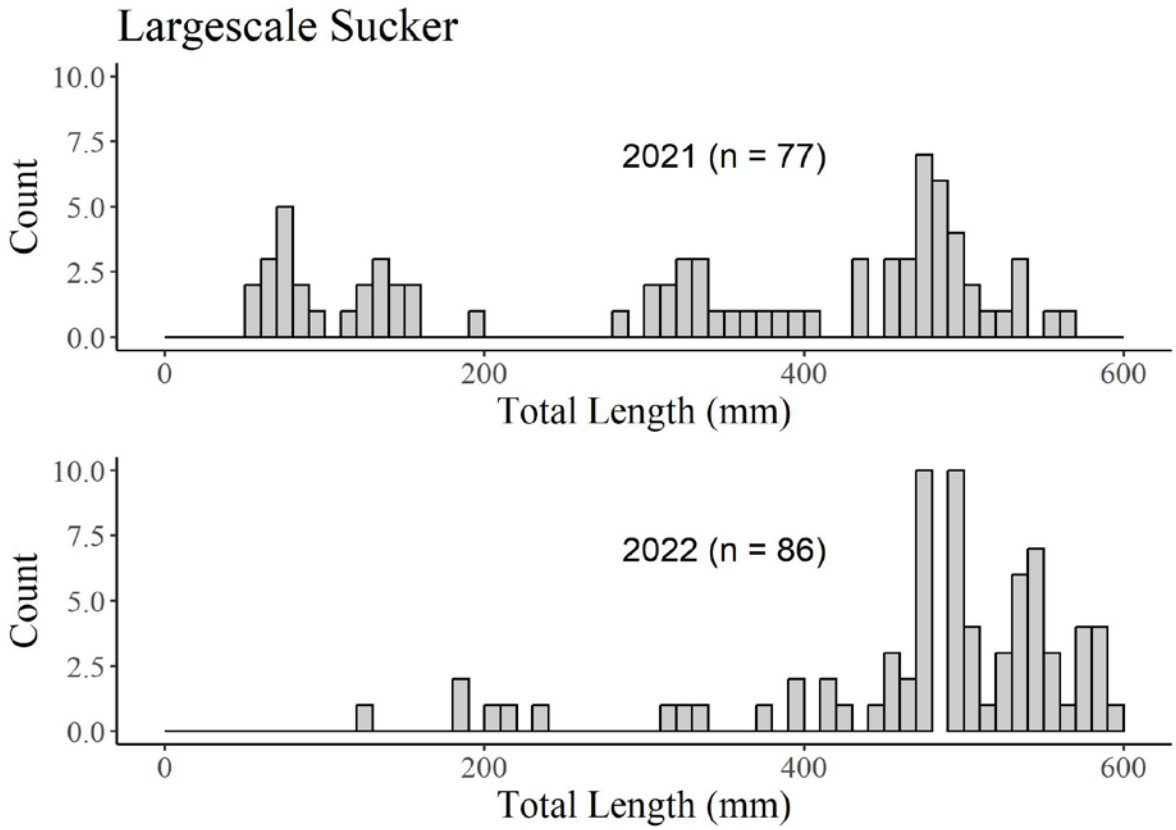

Figure 5. Length-frequency histogram for Largescale Sucker captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

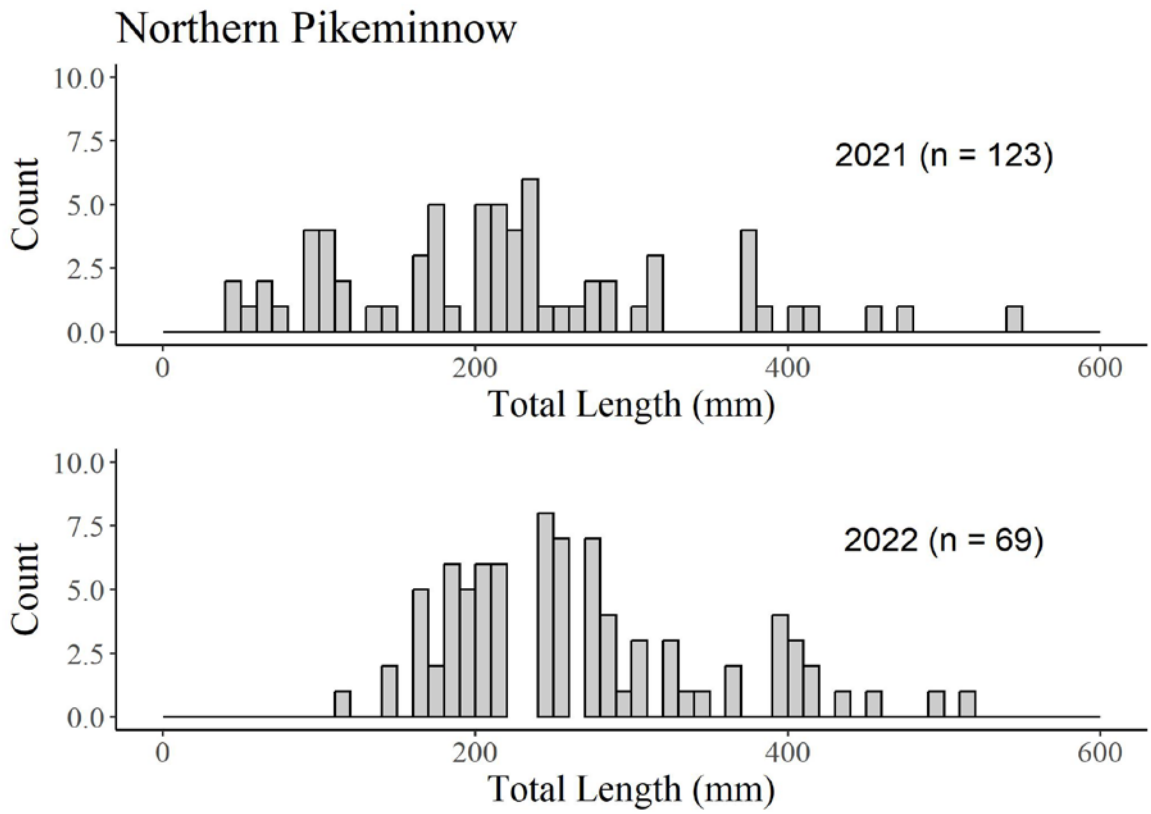

Figure 6. Length-frequency histogram for Northern Pikeminnow captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

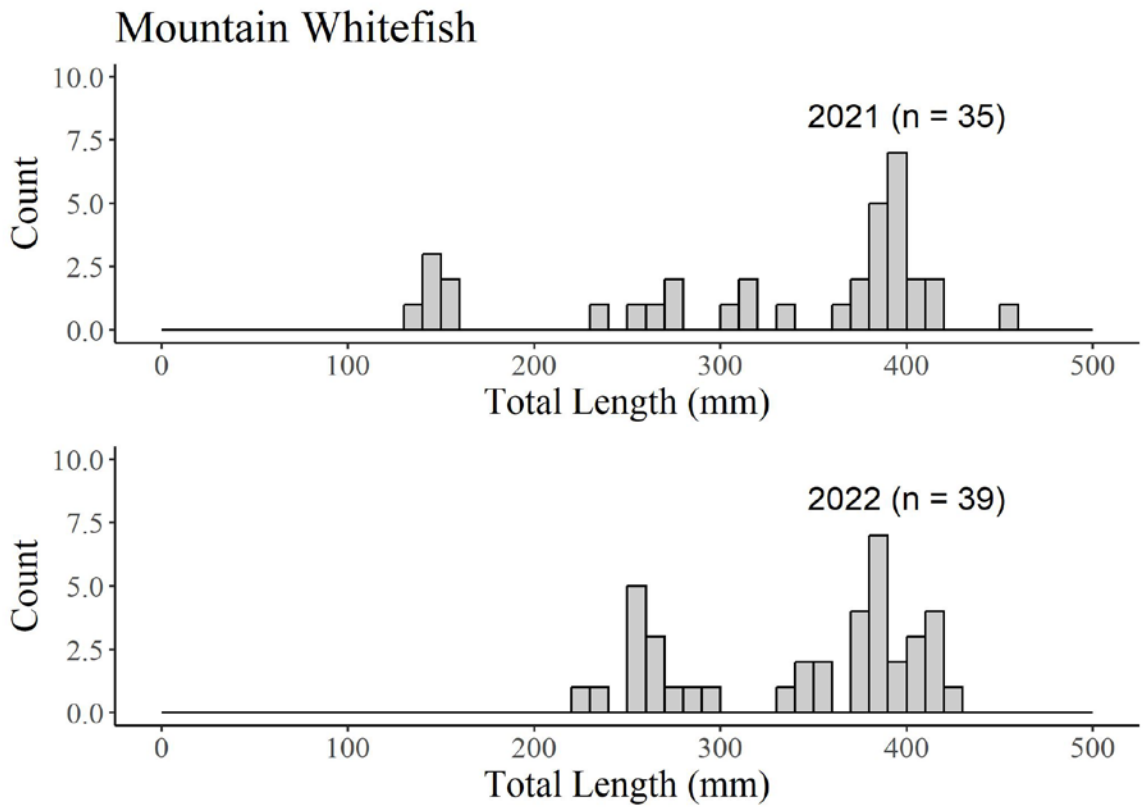

Figure 7. Length-frequency histogram for Mountain Whitefish captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

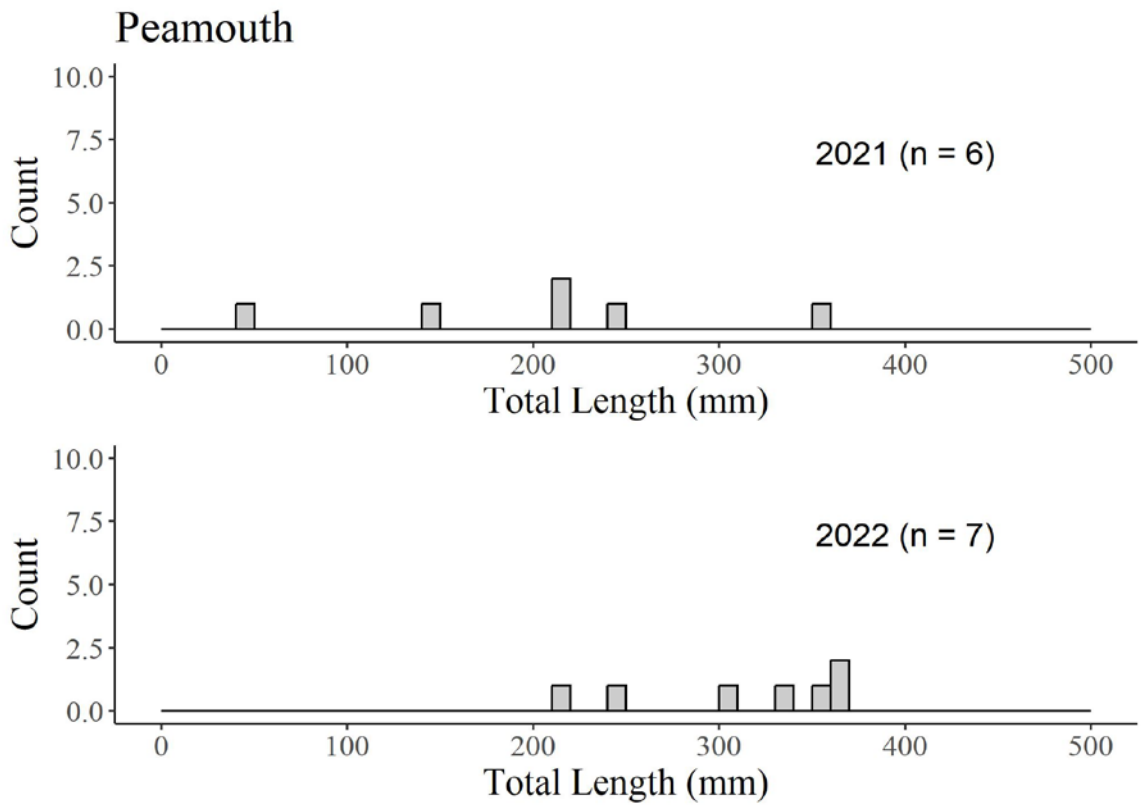

Figure 8. Length-frequency histogram for Peamouth captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

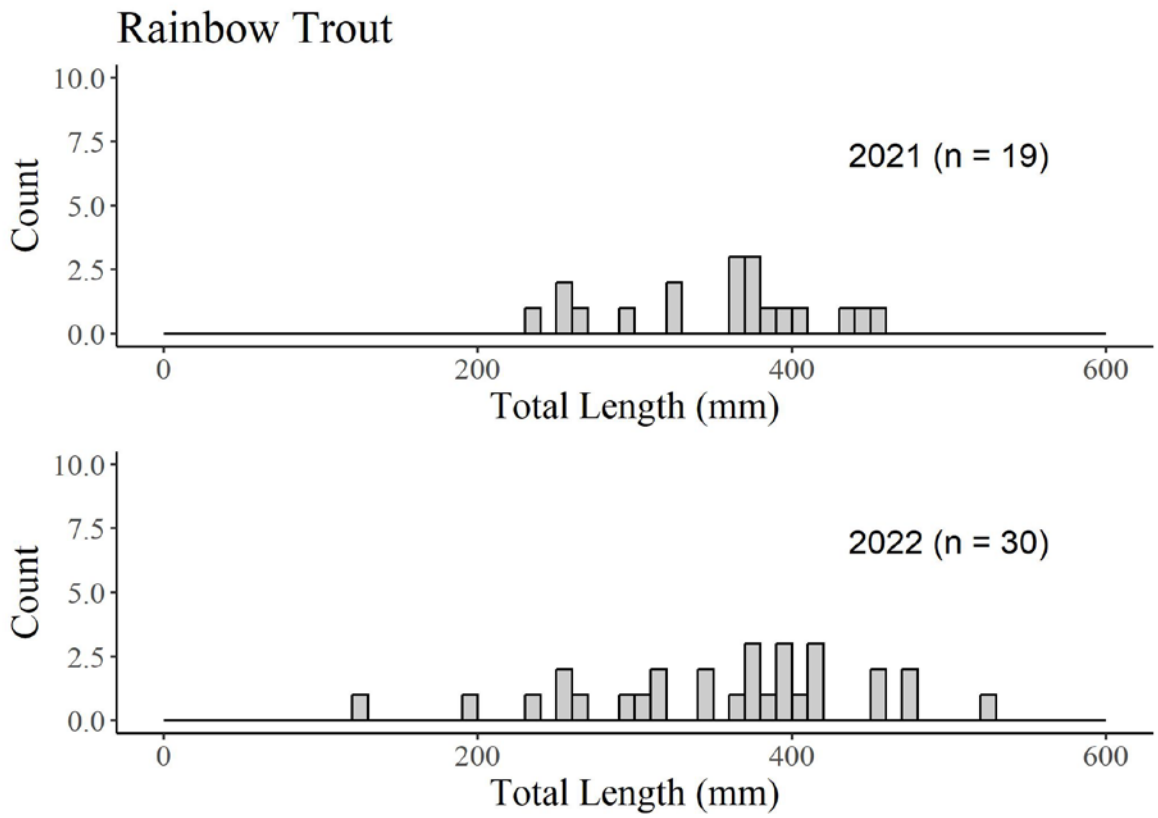

Figure 9. Length-frequency histogram for Rainbow Trout captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

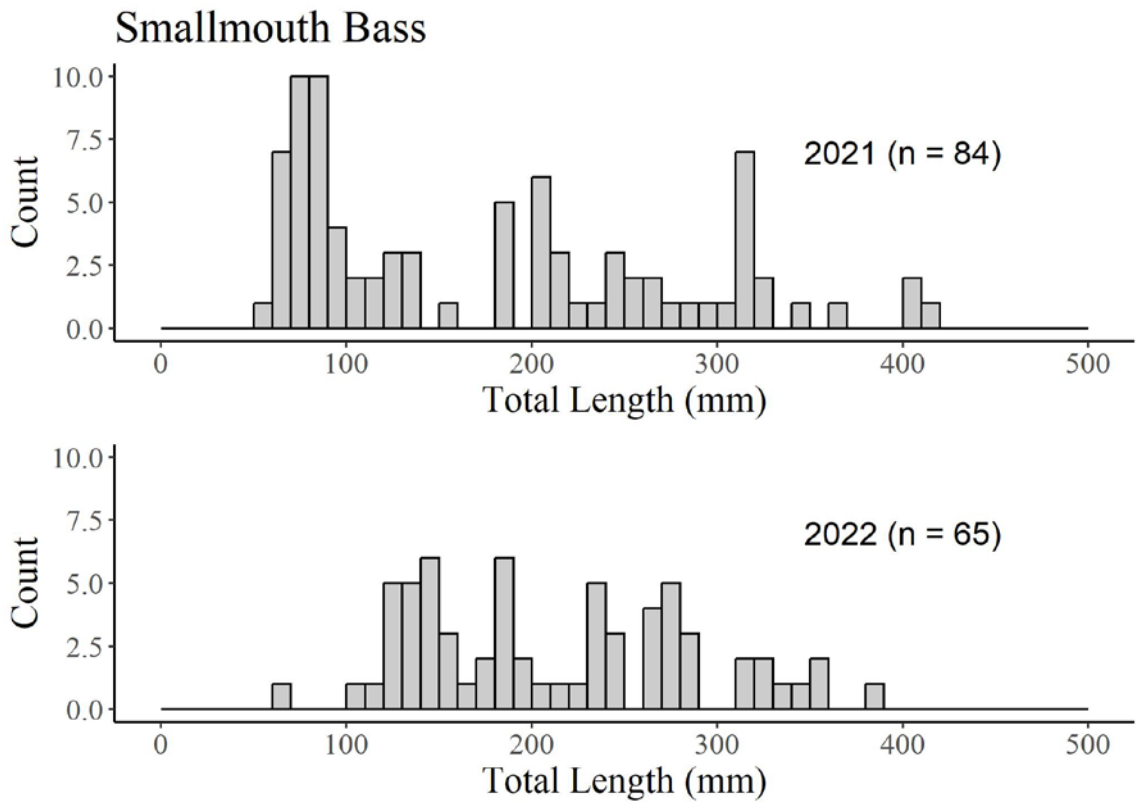

Figure 10. Length-frequency histogram for Smallmouth Bass captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

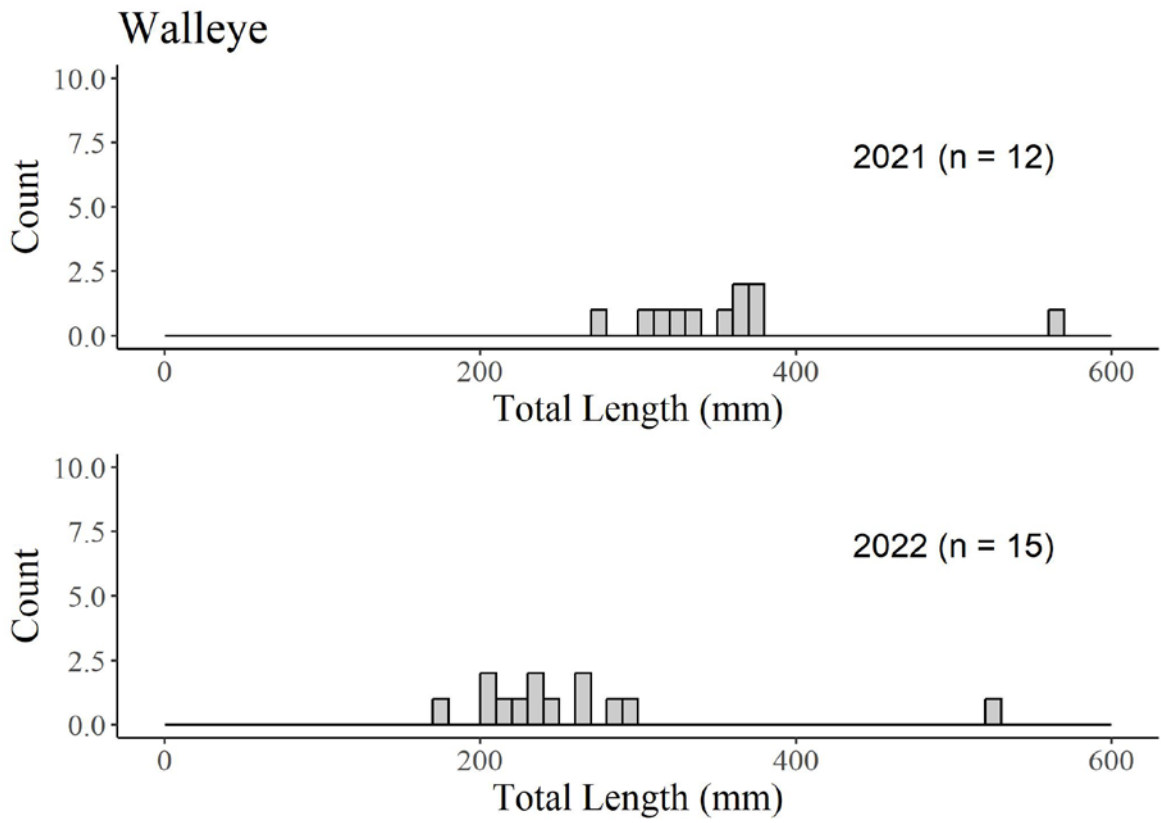

Figure 11. Length-frequency histogram for Walleye captured in the Clark Fork River CPUE monitoring during 2021 (Ransom et al. 2022; top panel) and 2022 (bottom panel).

RECOMMENDATIONS

1) Complete another round of the CPUE monitoring on the lower Clark Fork River in 2023.
2) Repeat mark-recapture sampling in 2024 as part of the standard 3-year sampling rotation.

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