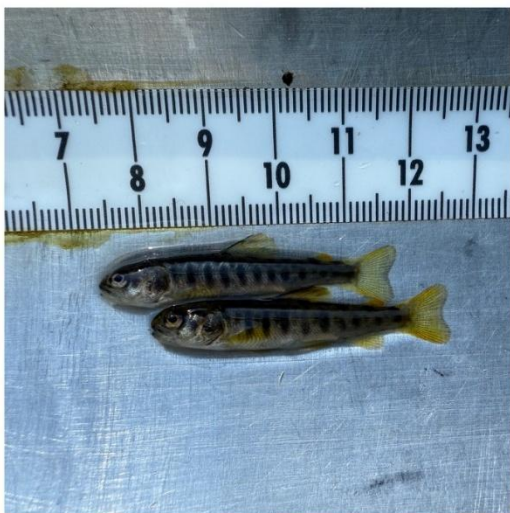


Fisheries Monitoring in the Upper Clark Fork River Basin 2025 Report



Prepared By:

Tracy Elam, Caleb Uerling, Pat Saffel and Brad Liermann

Montana Fish, Wildlife and Parks

Region 2, Fisheries Division

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Abbreviations for fish species present in the Upper Clark Fork River.

Species	Species abbreviation
Brook Trout	EB
Brook Trout X Bull Trout Hybrid	EBxBULL
Brown Trout	LL
Brook Trout X Brown Trout Hybrid	EBxLL
Bull Trout	BULL
Central Mud Minnow	CM MN
Kokanee	KOK
Lake Trout	LT
Largemouth Bass	LMB
Largescale Sucker	LS SU
Longnose Sucker	LN SU
Longnose Dace	LN DC
Mountain Whitefish	MWF
Northern Pike Minnow	N PMN
Rainbow Trout	RB
Rainbow Trout X Westslope Cutthroat Trout	RBxWCT
Redside Shiner	RS SH
Rocky Mountain Sculpin	RM COT
Sculpin (unidentified)	COT
Columbia Slimy Scuplin	SL COT
Westslope Cutthroat Trout	WCT
Yellow Perch	YP

Introduction

The Upper Clark Fork River (UCFR) was subject to extensive mining and mineral processing activities during the late 19th and early 20th centuries. Metal contamination has reduced habitat quality and altered the fishery in the UCFR. Fishery changes include reduced trout numbers and changes in species composition. Because of these negative impacts, angling use of the Clark Fork River is lower compared to other rivers in western Montana. Extensive remediation and restoration efforts are underway, and these efforts aim to mitigate historical mining and smelting damage to natural resources in the Upper Clark Fork River Basin (UCFRB). Effects of these actions have been dramatic in Silver Bow Creek, where remedial activities have allowed the return of trout after being extirpated for more than a century (Naughton 2013). The Silver Bow Creek fishery may continue to change in response to improvements in water quality, maturation of riparian vegetation, natural changes in river morphology, tributary restoration projects, flow enhancements, etc. Remedial efforts on the mainstem of the Clark Fork River are more recent and the area slated for restoration projects is vast (see Saffel et al. 2018). Thus, monitoring fisheries responses to restoration needs to be done at multiple spatial and temporal scales (Geum Environmental 2015).

Fisheries data collection was conducted sporadically in the UCFRB in the past. Starting in 2008, FWP biologists began establishing seven long term monitoring sections on the mainstem UCFR. FWP has completed population estimates in six of the seven sections each of the subsequent years. These mainstem population surveys provide a dataset that can be used to evaluate the mainstem Clark Fork River fishery before, during, and after restoration and remediation actions. Annual fisheries surveys in Silver Bow Creek began as early as 2002 when the first suckers and sculpins were detected at the Rocker section. Silver Bow Creek surveys initially consisted of one-pass electrofishing conducted in the fall. More sections were added in 2014, and sampling occurred in both spring and fall. The first fish population estimates were attempted in Silver Bow Creek in 2015, both in spring and fall. The spring sampling was shifted to summer from 2016-2018 and population estimates were conducted in summer and fall at six sections. The summer sampling is conducted during low flows and high-water temperatures during some years. Low dissolved oxygen has been documented in the past during the summer and hypoxic areas of Silver Bow Creek tend to be devoid of trout during this period (Naughton 2013). Fall sampling is focused on evaluating fish numbers and distribution when water temperatures have cooled, and dissolved oxygen concentrations are more favorable to fish.

Multiple tributaries have been identified as priorities for restoration in the UCFRB (Saffel et al., 2018). Preliminary data on species composition and distribution were collected in multiple watersheds during the late 2000s (Lindstrom et al. 2008, Liermann et al. 2009). Population estimate sections were established in priority tributaries and these sections were sampled every year from 2015-2017. Larger streams (Warm Springs Creek, Little Blackfoot River, and Flint Creek) are now sampled once every two to three years, while smaller tributaries are sampled every third year or when deemed appropriate based on restoration priorities and actions.

As restoration projects have been completed in the tributaries, there have been increased opportunities to evaluate these projects and their fisheries benefits. However, due to the sheer number of restoration

projects in the UCFRB, not all projects can be specifically monitored. This limitation requires careful prioritization of project-level monitoring efforts. Project monitoring to date has focused on getting pre- and post- project fisheries data on large projects (i.e., the Allendale Canal), gathering data on different restoration approaches, or evaluating the potential for projects to provide benefits to fish. We describe project level monitoring in Spotted Dog Creek in this report.

FWP identified and began monitoring significant brown trout population declines on the very upstream reaches on the Clark Fork River around or shortly after 2015. NRDP and FWP monitoring and research funding and priorities have recently shifted from project monitoring to studying and identifying underlying causes for the trout population declines in the mainstem river. These efforts include a graduate study funded by FWP in conjunction with NRDP resources allocated to the topic. The graduate student began work in the spring of 2026, but FWP began piloting some methods for the study using NRDP funding in Fiscal Year 2025. The pilot work completed in 2025 is summarized in this report. Future work completed by the graduate student will be reported in stand-alone reports that will be provided to NRDP.

Clark Fork River Mainstem

Population surveys

Trout population estimates are usually conducted in spring at up to seven established sections on the Clark Fork River. These sections are sampled annually by FWP and are referred to as Bearmouth, Morse Ranch, Phosphate, Williams Tavenner, Below Sager Lane, pH Shack to Perkins Lane, and pH Shack (Map 1). Other sections have been added as remediation has progressed, and some sites aren't monitored every year because there is not enough time during the sampling season to sample all sections. The sections completed in 2025 were pH Shack, Perkins Lane to Galen Bridge, Racetrack Bridge to Huey Long's, Below Sager Lane, Williams Tavenner, Phosphate, Morse Ranch and Bearmouth.

Fish were collected using drift boats with a mounted electrofishing unit, two front boom anodes and one netter. Estimates were made using two marking runs and two recapture runs. Recapture runs were completed one week after marking runs. All captured trout were identified to species, weighed (g), measured (mm), and marked with a small fin clip. Population estimates for fish ≥ 175 mm (~7 in) were generated using the Chapman modification (Chapman 1951) of the Petersen method provided in Montana Fish, Wildlife and Park's Fisheries Information System. Estimates were calculated for trout species that had a minimum of 4 marked fish recaptured (B. Liermann, Montana, Fish, Wildlife, and Parks, personal communication, 2014). The pH Shack section was sampled with different gears starting in 2023 to assess the population of fish less than 175 mm. Instead of the normal drift boat electrofishing, a small barge unit was used. This set up used two mobile electrodes, two netters and one barge operator. This allowed for more targeted sampling of smaller fish while still allowing the capture of larger fish. Two marking runs and two recapture runs were conducted.

Annual Sections

Eight monitoring sites were sampled in 2025 (Table 1). Most sites have been sampled annually since 2008 and 2009 (Figure 4). For the pH Shack section, estimates were produced using two different

methods. The first estimate is for all fish greater than 175 mm pooled together. The brown trout estimate for 2025 was 52(42-68) fish/km which is up from 26(16-49) fish/km in 2024 and 19(12-35) fish/km in 2023. The 2023 estimate was the lowest ever observed dating back to the 1970's. The use of the small barge allowed us to produce estimates for fish between 75-174 mm. The 2025 brown trout estimate for fish between 75-174 mm was 344(291-421) fish/km which is up from 222(182-277) fish/km in 2024 and closer to numbers from 2023 (372(251-569) fish/km). Around 2/3 of those fish were in the 75-124 mm length group for all years (Figure 1). Using the age data from an otolith microchemistry study that was completed in 2023, we were able to estimate the number of fish per km per age class from the barge electrofishing data. A comparison of fish per age class is shown in Figure 2.

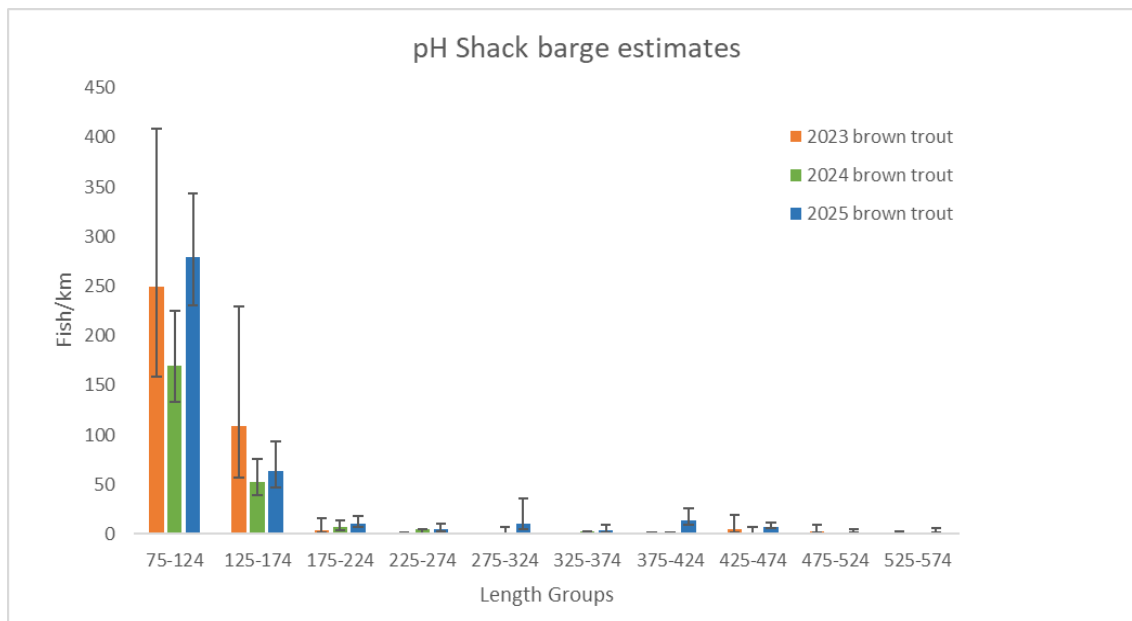


Figure 1. Comparison of the brown trout estimates per length group using the tote barge.

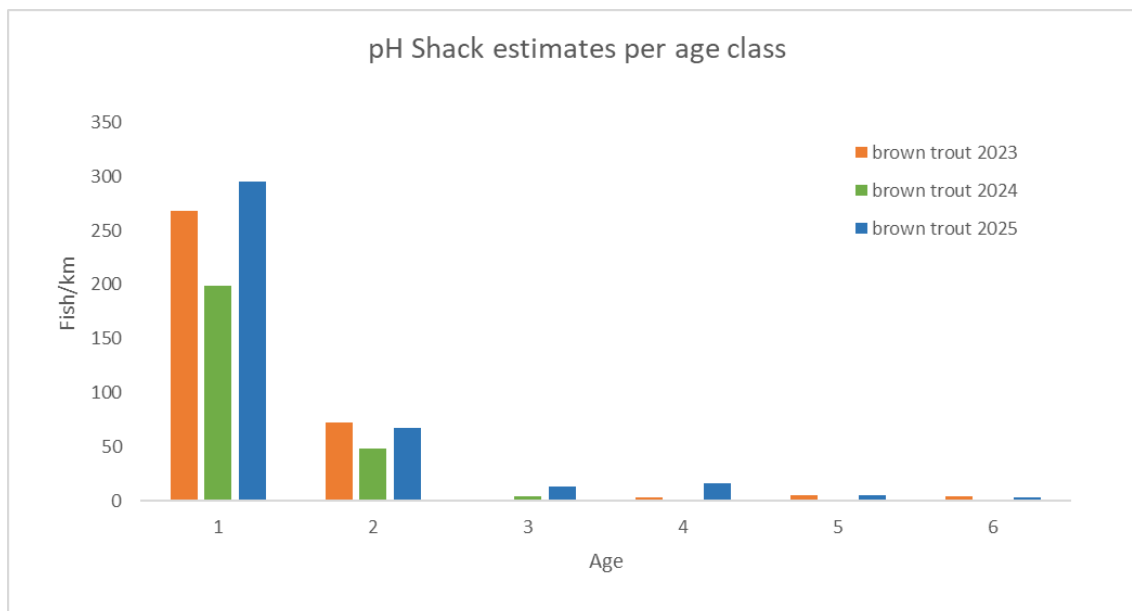


Figure 2. Population estimates per age class with ages derived from otolith aging done in previous studies.

The remainder of the long-term monitoring sections were done using the same techniques as in past years. The 2025 brown trout estimate for Perkins Lane to Galen Bridge was 79(59-108) fish/km. The last time an estimate was produced for this section was in 2022 and the brown trout estimate was 146(69-333) fish/km. A section from Racetrack Bridge to Huey Long's was added in 2024 since restoration and remediation activity was set to begin in that reach. It had been surveyed in 2009 and 2015 during all-river sampling events. The 2025 brown trout estimate was 113(74-182) fish/km which is up from 38(18-96) fish/km in 2024 and closer to the 2015 (132(89-202) fish/km) and 2009 (129(94-183) fish/km) estimates. The Below Sager Lane section brown trout estimate for 2025 was 129(98-176) fish/km, down from 151(67-362) fish/km in 2024. The Williams-Tavener section brown trout estimate for 2025 was 133(101-179) fish/km, down from 171(105-297) fish/km in 2024. The Phosphate section brown trout estimate for 2025 was 143(114-183) fish/km, down from 176(125-254) fish/km in 2024. The Morse Ranch section saw an increase in the brown trout estimate in 2025 with 86(72-103) fish/km, up from 71(56-91) fish/km in 2024. We were also able to produce a Westslope cutthroat trout estimate of 7(2-14) fish/km in 2025, similar to the 2024 estimate of 8(3-19) fish/km. The Bearmouth section brown trout estimate for 2025 was 32(23-41) fish/km, down from 52(40-67) fish/km in 2024. The combined *Oncorhynchus* estimate in the Bearmouth section for 2025 was 43(35-54) fish/km, down from 54(40-75) fish/km in 2024. The rainbow trout estimate was 31(24-42) fish/km and the westslope cutthroat trout estimate was 12(9-17) fish/km.

Fall Sampling

In addition to the spring sampling on the UCFR, two sites were sampled in the fall of 2025 to get an idea of how the fish community looks heading into the winter and as part the pilot work associated with the graduate study. The two sections sampled in the fall were pH Shack and Perkins Lane to Galen Bridge. This sampling was conducted using a drift boat equipped with one boom and one mobile anode. This gave us the ability to target habitat for smaller fish with the mobile anode while still shocking open water for larger fish. The brown trout estimate for the pH Shack section in the fall was 250(137-484) fish/km compared to 52(42-68) fish/km in the spring. This jump in population size estimate is probably due in part to larger brown trout moving into the section to prepare for spawning. We were unable to get an estimate for fish under 175 mm because we did not capture any marked fish in our recapture run. I compared the total number of fish captured in three different length categories between spring and fall sampling. For fish under 150 mm in length, we captured 530 in the spring and 78 in the fall. Most of the fish within this length group would be age 1 fish. For fish between 150-250 mm in length, we captured 47 in the spring and 64 in the fall. This length group would be made up mostly of age 2 fish. For fish greater than 250 mm in length, we captured 103 in the spring and 92 in the fall. Different sampling gears were used between spring and fall sampling so capture efficiencies may differ between sampling periods. In the Perkins Lane to Galen Bridge section, we only completed an estimate in the spring. Comparing just the marking run from the spring and the single pass from the fall, for fish under 150 mm in length, we captured 40 in the spring and 117 in the fall. For fish between 150-250 mm in length, we captured 35 in the spring and 144 in the fall. For fish greater than 250 mm in length, we captured 97 in the spring and 211 in the fall. Starting in 2026 we will begin using the same gear and technique used in the fall of 2025 on all sections upstream of Gemback Road, this will allow us to better target age 1 brown trout.

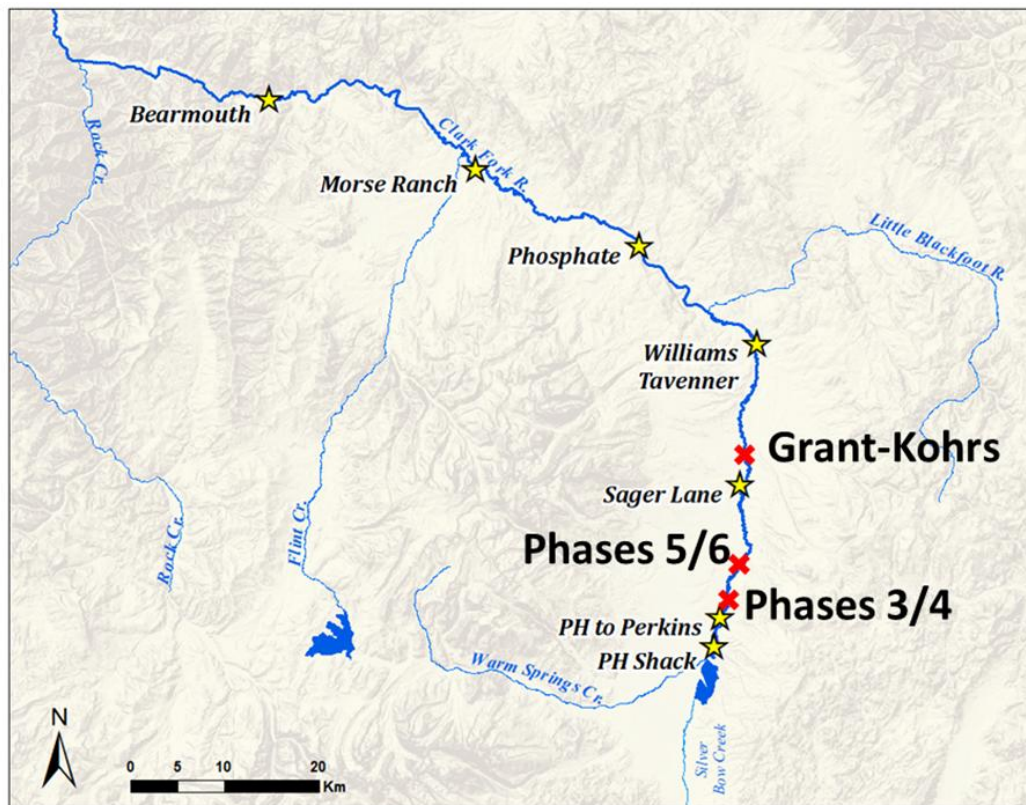
Discussion

Brown trout population estimates continue to be below the long-term averages upstream of Deer Lodge in the pH shack section, but the below Sager Lane section has rebounded to near the long-term average (Figure 4). The pH Shack section estimates have been trending slightly upward since the lowest estimate on record in 2023 but are still below the five-year average. Since changing sample methods in 2023 on the pH Shack section we can estimate the number of fish per age class. This may provide some idea of survival of fish from one age class to the next. Data from 2025 shows a positive trend for the survival of age 3 and 4 brown trout (Figure 2). Estimates Below Sager Lane were above the long-term average in 2024, however that estimate had wide confidence intervals due to poor capture efficiency. The 2025 estimate was near the long-term average with much better capture efficiency. The past two years have had the highest estimates Below Sager Lane since 2016 and are above the five-year average. Brown trout numbers below Deer Lodge in the Williams Tavenner section seem to be on a slight downward trend over the past four years. Estimates were above or near the long-term average in 2022 and 2024 but below the five-year average in 2023 and 2025. The estimates in the Phosphate section have been below the long-term average for the past 8 years, but above the five-year average every other year since 2020. Overall, the trout populations in the Williams Tavenner and Phosphate sections have been relatively stable and near or slightly under long-term averages. Estimates in the Morse Ranch section have been at or above the long-term average for three of the last five years and the long-term and five-year averages are nearly the same. *Oncorhynchus* numbers remain low but stable in this section. The Bearmouth section is the only long-term monitoring site where brown trout numbers have been at or above the long-term average over the last several years. The five-year average is slightly higher than the long-term average. Brown trout and *Oncorhynchus* numbers are similar for the long-term average, but *Oncorhynchus* are more abundant in the five-year average. Estimates of total trout in the Bearmouth section have also been produced. Combined brown trout and *Oncorhynchus* numbers have been above the long-term average for the past four years and the five-year average is higher than the long-term average (Figure 3).

Coinciding with the decline in brown trout densities in the UCFR above Deer Lodge is the remediation and restoration of the UCFR. Along with removing tailings material, remediation also removes much of the overhanging vegetation and undercut banks. Overhanging vegetation and undercut banks provide cover for brown trout and other fish species. Remedial efforts aim to put the river on a path to re-form these habitat features eventually, but this will likely take years or decades. Habitat simplification may be contributing to the decline in trout numbers in the UCFR, but it is unlikely that habitat simplification is the main driver of the significant declines observed in the very upper reaches. Brown trout are a generalist trout species and tend to do okay in degraded or simplified habitat conditions. FWP has started doing more targeted sampling to understand changes in trout numbers in remediated and unremediated parts of the river. Our data show that declines in brown trout numbers have occurred in both remediated and unremediated reaches of the river. NRDP and FWP have allocated funds to further study trout declines and the cause of these declines. Studies will focus on fish production and survival, water quality, and habitat. Results from this effort will be available in the coming years.

Factors such as water quality, disease, environmental conditions other than minimum flows, or a combination of other factors are likely responsible for the decline in trout numbers in the UCFR. Brown

trout declines have also recently been reported on many southwest Montana rivers. FWP does not currently fully understand why brown trout declines are occurring at a regional, or even state-wide scale. FWP conducted a statewide study to investigate factors such as drought, disease, angling pressure, high temperatures and other variables. None of the variables evaluated in this study were found to be strong predictors of recent brown trout population trends at a statewide or regional scale, but various aspects of flow regimes were a common theme in some rivers (Cline et al. 2022). Additional to regional factors that may be affecting Montana brown trout fisheries, acute metal contamination and remedial habitat simplification are factors that may be affecting brown trout that are also unique to the UCFR.



Map 1. Sections of the Upper Clark Fork River sampled in recent years. Established annual sections are denoted by the yellow stars and sections targeting remediation and restoration by the red X's. The Grant-Kohrs section is within phases 15 and 16.

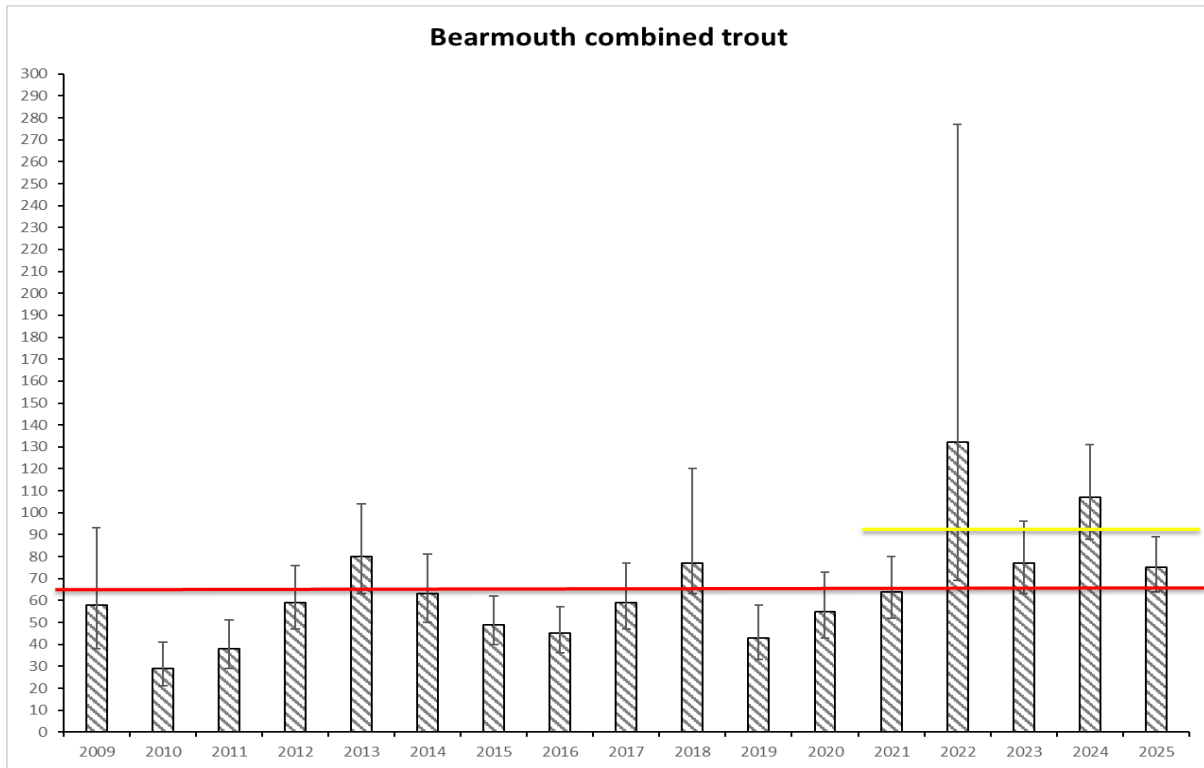


Figure 3. Combined trout estimates for the Bearmouth section. The red line denotes the long-term fish/km average, and the yellow line shows the 5-year fish/km average.

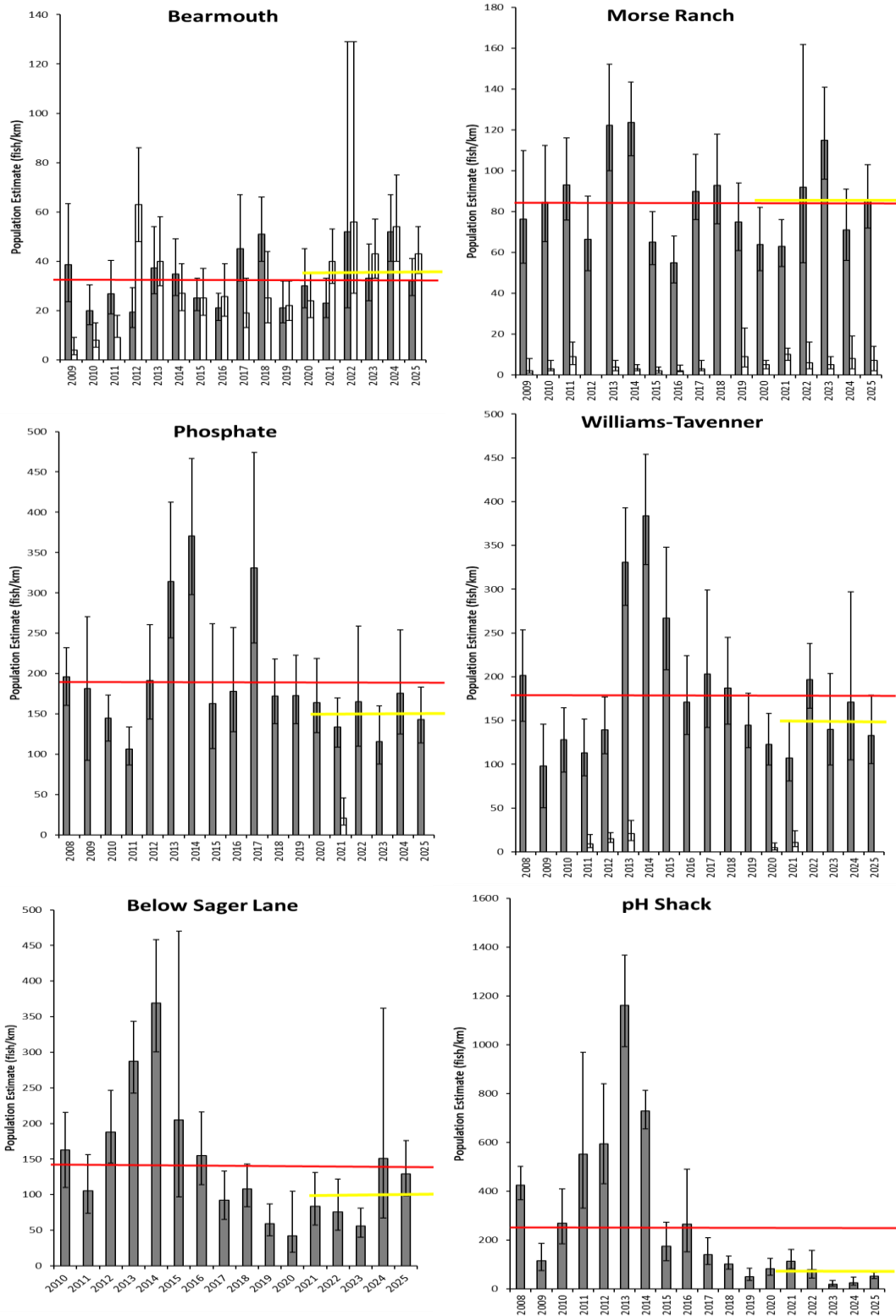


Figure 4. Population estimates for six long-term monitoring sections of the Clark Fork River for fish >175 mm. Grey bars are brown trout estimates, and open bars are combined *Oncorhynchus* estimates. The red line denotes the long-term fish/km average for brown trout, and the yellow line shows the 5-year fish/km average for brown trout.

Table 1. Electrofishing data collected in Spring 2025 from annual sampling sections on the Upper Clark Fork River. Population estimates (95% confidence interval) are for trout greater than 175 mm (~ 7") in total length. The WCT estimate at Bearmouth is combined with RBXWCT. The WCT estimate at Morse Ranch is combined with RB. Species abbreviations: LL = Brown Trout, WCT = Westslope Cutthroat Trout, RB = Rainbow Trout, BULL = Bull Trout, RBXWCT = phenotypic hybrid between Rainbow Trout and Westslope Cutthroat Trout, LS SU = Large Scale Sucker, MWF = Mountain Whitefish. **Combined Oncorhynchus.**

Section	Species	Population Estimate (fish/Km)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Bearmouth RM 254-260	BULL		5	338	220-477
	EB		1	227	227
	LL	32(23-41)	201	349	168-598
	RB	31(24-42)	101	325	185-433
	RBXWCT	16(9-28)	69	327	192-502
	WCT	12(9-17)	81	320	186-437
	LN SU		1	98	98
	LS SU		9	516	472-576
	MWF		250	322	145-456
	N PMN		1	470	470
Morse Ranch RM 274-280	LL	86(72-103)	516	364	175-603
	RB		3	295	203-468
	RBXWCT	7(2-14)	1	297	297
	WCT		20	332	216-402
Phosphate RM 287-289	LL	143(114-183)	276	320	71-486
	RBXWCT		1	535	535
	WCT		7	331	248-414
Williams Tavenner RM 306-308	EB		3	274	243-294
	LL	133(101-179)	237	401	168-565
	WCT		6	327	247-415
Below Sager Lane RM 315-318	EB		2	148	119-177
	LL	129(98-176)	287	345	116-524
Racetrack Bridge to Huey Long's	EB		2	219	155-282
	LL	113(74-182)	225	308	110-656
	RBXWCT		1	425	425
	WCT		1	425	425
Perkins Lane to Galen	LL	79(59-108)	351	295	97-549
	WCT		2	376	370-382
pH Shack RM 338-339.5	LL	52(42-68)	517	152	66-561
	MWF	98(69-145)	122	334	210-467
	RB		1	78	78
	RBXWCT		2	475	462-488
	WCT		2	357	272-442

CPUE Sites

Catch Per Unit Effort (CPUE) surveys have been conducted on the Bearmouth section annually since 2015 (Table 2). The CPUE section is approximately one mile long and is done at the beginning of the long-term monitoring section. For the CPUE survey all fish species are netted and recorded. This data can be used to determine species composition in the Clark Fork River; however, it should be noted that even though a certain fish species is not captured, it doesn't mean it isn't present. In Table 2 below, species composition is shown as a percentage of fish captured. A 0% should be interpreted as low abundance or low capture efficiency as opposed to not present. Mountain whitefish are the most captured fish, and brown trout are the most captured trout in the Bearmouth section.

Table 2. Percentage of fish captured at three CPUE sections on the Bearmouth section of the Clark Fork River. This section is a long-term mark/recapture estimate section. All fish species are netted in a portion of this section to determine species composition.

Section	Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Average
Bearmouth CPUE	BULL	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	LL	11%	8%	8%	4%	2%	6%	7%	13%	8%	3%	4%	7%
	LN SU	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	LS SU	16%	8%	3%	19%	7%	10%	8%	4%	4%	6%	3%	8%
	MWF	63%	83%	84%	74%	85%	80%	72%	70%	78%	88%	85%	78%
	N PMN	1%	0%	1%	1%	0%	0%	1%	0%	0%	1%	0%	0%
	RB	6%	1%	3%	3%	3%	0%	3%	6%	5%	2%	2%	3%
	RBXWCT	0%	0%	0%	0%	1%	3%	2%	0%	0%	0%	2%	1%
	RM COT	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
	RS SH	0%	0%	0%	0%	1%	0%	4%	0%	0%	0%	0%	0%
	WCT	1%	0%	1%	0%	1%	1%	3%	7%	5%	1%	2%	2%
	EB	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Blacktail Creek

Four sections were sampled on Blacktail Creek in 2025 (Table 3). All four sections had only two trout species present, brook trout and westslope cutthroat trout. The lowest section at the Butte Country Club is dominated by brook trout. Westslope cutthroat trout become more prevalent in upstream reaches. These sections were last surveyed in 2022, and the pattern of species composition is shifting toward brook trout at the middle two sites. Brook trout are more abundant in the lower two sections and by the third section the population is about 50/50 brook trout to westslope cutthroat trout. Although the estimates are close in the middle two sections, it has changed from westslope cutthroat trout being more abundant to brook trout being more abundant. At the uppermost section there are more westslope cutthroat trout than brook trout, and numbers have been increasing for both species since 2020 (Figure 5).

Table 3. Electrofishing data collected in 2025 from four sampling sections on Blacktail Creek. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Golf Course	EB	391(378-404)	455	94	60-282
Butte CC	WCT	5(4-6)	5	184	143-230
Above 9 Mile	EB	89(72-105)	92	115	80-200
	WCT	45(41-49)	58	96	66-195
Upper Thompson	EB	50(57-64)	54	118	63-190
	WCT	49(46-52)	48	102	77-193
Lower Forest Boundary	EB	43(42-44)	56	124	61-210
	WCT	63(60-66)	69	96	23-176

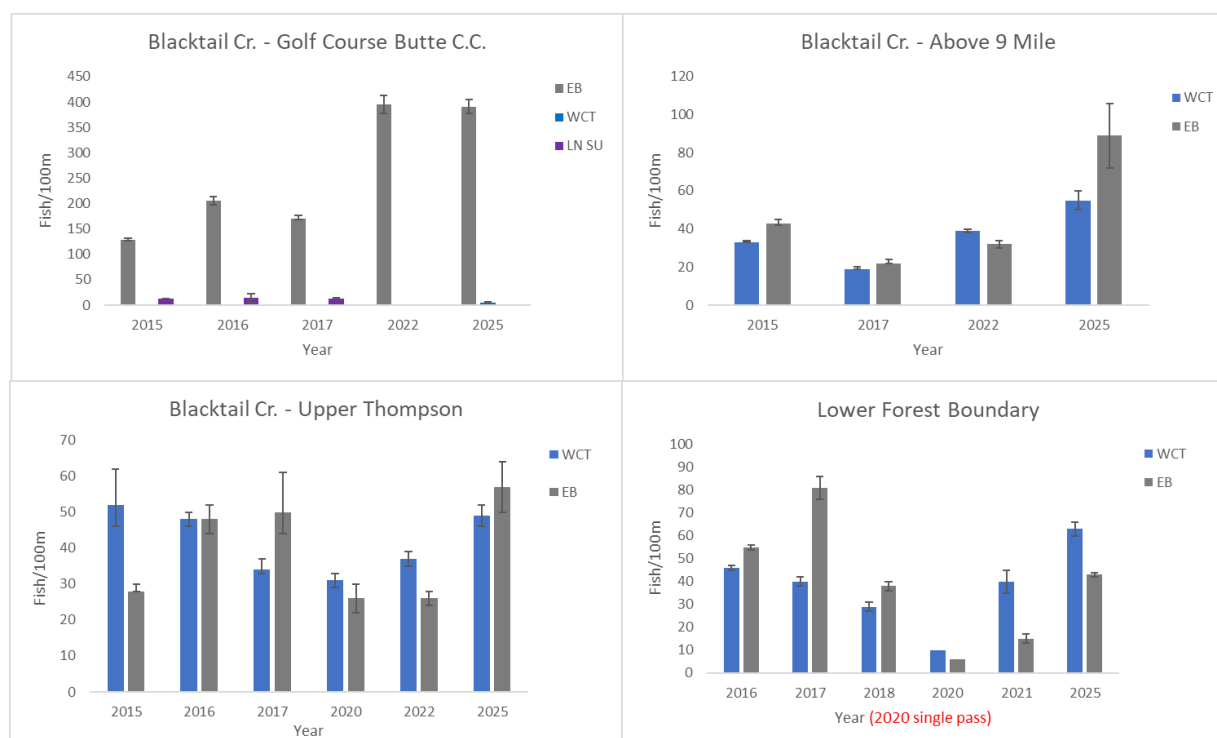


Figure 5. Depletion estimates of westslope cutthroat trout and brook trout at four sites on Blacktail Creek.

Browns Gulch

Five sections were sampled on Browns Gulch in 2025 (Table 4). The only trout species present in the lower two sections was brook trout. The number of fish in the lower two sections is very low, and the length range of fish is lower than the upper three sections. Brook trout and westslope cutthroat trout are present in the upper three sections. Brook trout numbers are higher than westslope cutthroat trout

in all three of the upper sections. Brook trout estimates are down at most sites compared to 2017 estimates. Westslope cutthroat trout estimates are slightly higher in the upper two sections compared to 2017 estimates (Figure 6).

Table 4. Electrofishing data collected in 2025 from five sampling sections on Browns Gulch. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Lower Ueland RM 2.6	EB	9(9-10)	14	95	71-129
Upper Ueland RM 5.3	EB		5	81	59-95
Brothers Ranch RM 9.7	EB		20	153	76-242
	WCT		6	121	99-194
Balentine RM 11.5	EB	34(29-40)	38	120	47-225
	WCT	16(14-17)	14	149	76-240
Upper Forest Service RM 15.3	EB	88(85-91)	87	137	83-194
	WCT	13(12-14)	15	133	29-193



Figure 6. Depletion estimates of westslope cutthroat trout and brook trout at five sites on Browns Gulch.

Mill Creek

Three sections were sampled on Mill Creek in 2025 (Table 5). The lowest section has a population of brook trout and brown trout with brook trout being most abundant. Since it was last sampled in 2021, brook trout numbers have increased, and brown trout numbers have decreased. Westslope cutthroat trout become more abundant in further upstream reaches and by the upper most section are the most abundant trout species present. In the middle section, no brook trout were captured in 2021 and only five were captured in 2025. Westslope cutthroat trout estimates increased in this section in 2025, and brown trout estimates declined. In the uppermost section, westslope cutthroat trout estimates declined in 2025 while brook trout and brown trout numbers increased compared to 2021 (Figure 7).

Table 5. Electrofishing data collected in 2025 from three sampling sections on Mill Creek. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout, LL = Brown Trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Below Golf Course	EB	62(59-65)	83	108	52-245
	LL	21(20-22)	23	161	54-335
Below Diversion	EB		5	107	64-172
	LL	16(15-17)	20	183	61-322
	WCT	19(18-20)	19	171	117-295
Below Falls Amorex	EB	13(11-15)	13	159	130-185
	LL	7(6-8)	7	246	175-303
	WCT	31(27-35)	31	151	41-254

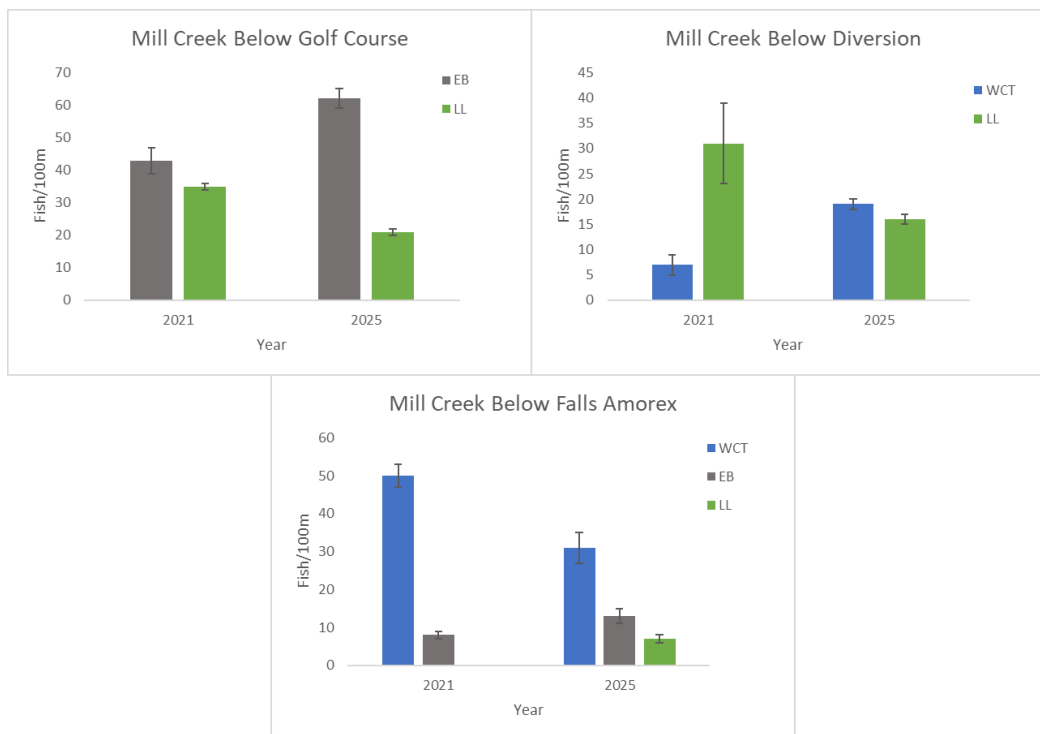


Figure 7. Depletion estimates of westslope cutthroat trout and brook trout at three sites on Mill Creek.

Willow Creek

Two sections were sampled on Willow Creek in 2025 (Table 6). Only brook trout were captured in the lowest section. The estimate for 2025 was the highest since sampling began. Brown trout and westslope cutthroat trout have been captured here in the past, but in very low numbers. The population shifts in the upper section where westslope cutthroat trout are most abundant. The westslope cutthroat trout estimate has decreased since 2021 and the brook trout estimate has increased (Figure 8).

Table 6. Electrofishing data collected in 2025 from two sampling sections on Willow Creek. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Lower Powerline Crossing	EB	95(91-99)	93	117	75-204
WMA	EB	34(32-36)	35	132	69-230
	WCT	56(51-61)	56	122	43-200

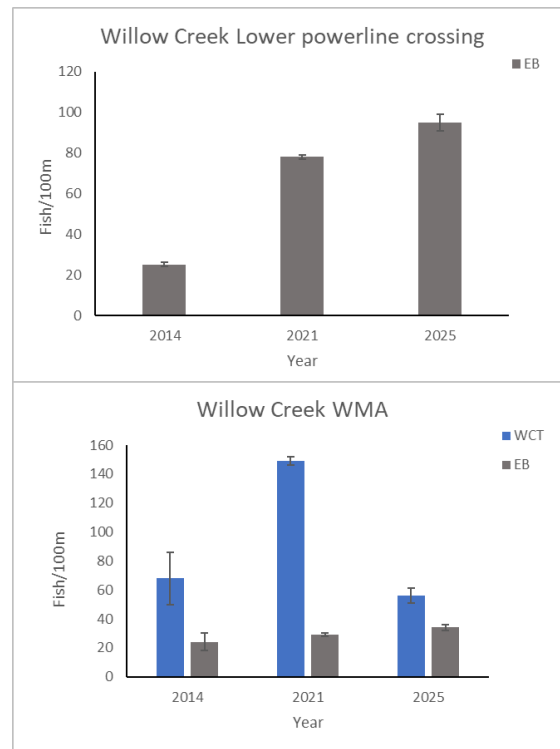


Figure 8. Depletion estimates of westslope cutthroat trout and brook trout at two sites on Willow Creek.

German Gulch

Three sections were sampled in German Gulch in 2025 (Table 7). All three sections have seen little change over time. Westslope cutthroat trout are the most abundant species in all three sections and numbers seem to be stable over the past decade of sampling (Figure 9). Brook trout are present in the lower two sections, and their populations are about half of westslope cutthroat trout at both. Westslope cutthroat trout are the only species present in the upper section. Population numbers are low in the upper section compared to the rest of German Gulch, but the stream is also very small at that point.

Table 7. Electrofishing data collected in 2025 from three sampling sections on German Gulch. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Lower RM 0.2	EB	29(28-30)	55	137	77-236
	WCT	72(71-74)	137	133	70-326
Middle RM 3.0	EB	40(35-45)	38	118	95-186
	WCT	74(68-80)	86	101	55-225
Upper RM 6.0	WCT	8(6-10)	29	84	52-197

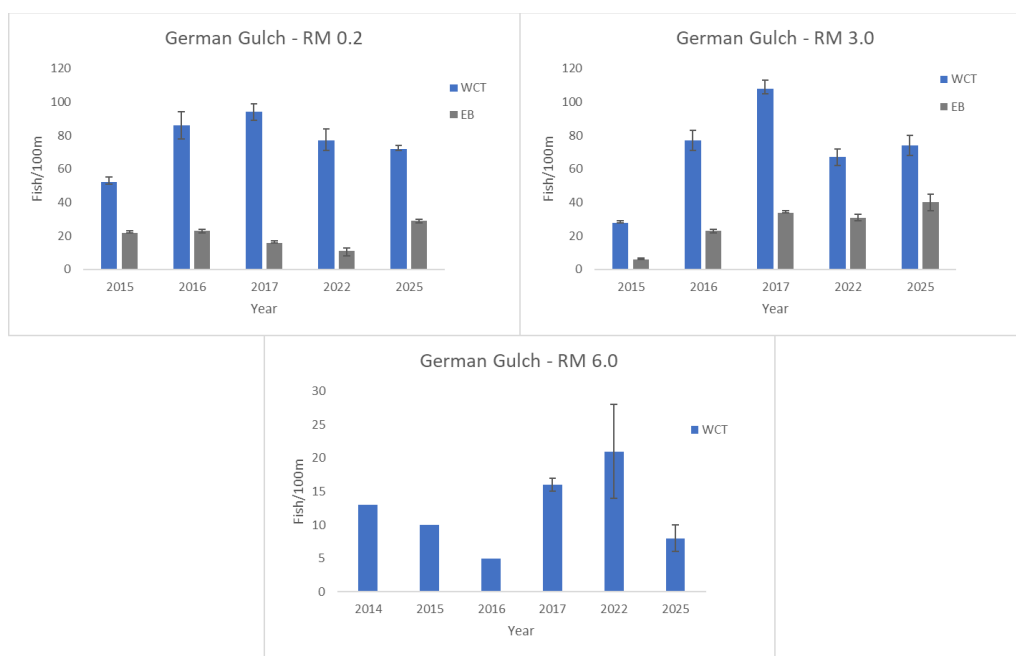


Figure 9. Depletion estimates of westslope cutthroat trout and brook trout at three sites on German Gulch.

Beefstraight Creek

Two sections were sampled in Beefstraight Creek in 2025 (Table 8). Beefstraight creek was sampled annually from 2014 to 2017 at two sites. At both sites there have always been more westslope cutthroat trout than brook trout. Sampling at these two sites was repeated in 2025 and westslope cutthroat trout continue to be more abundant than brook trout (Figure 10). The estimates for westslope cutthroat trout in 2025 were the highest at both sites since monitoring began. The estimates for brook trout were down at the lower site compared to the previous two surveys but were higher at the upper site compared to previous surveys.

Table 8. Electrofishing data collected in 2025 from two sampling sections on Beefstraight Creek. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope Cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Above Lower Bridge RM 1.3	EB	25(17-33)	44	120	45-225
	WCT	87(82-93)	158	138	60-246
Below Spring Creek Trail Crossing RM 4.5	EB	50(28-72)	39	123	90-215
	WCT	127(70-184)	86	135	80-206

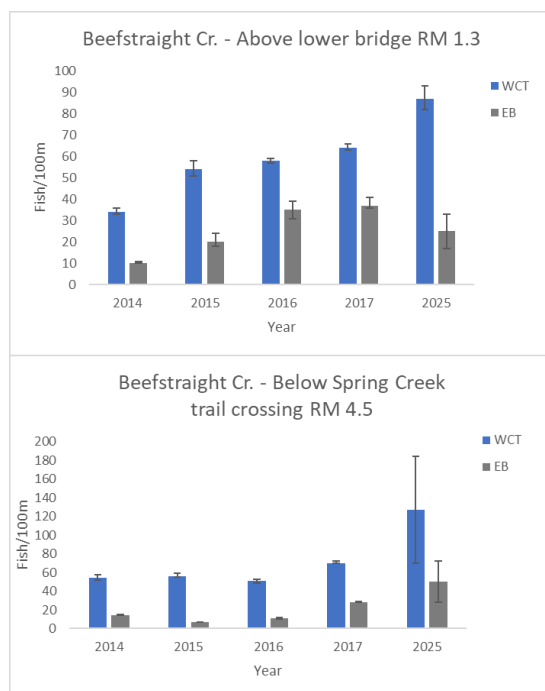


Figure 10. Depletion estimates of westslope cutthroat trout and brook trout at two sites on Beefstraight Creek.

Silver Bow Creek

Sampling strategy

Fisheries monitoring in Silver Bow Creek began in earnest when the first fish (suckers and sculpins) were documented near Rocker in 2002. As fish populations expanded in response to remediation, fish monitoring efforts also expanded. Over the years, most fish surveys have occurred during the fall. However, spring surveys were conducted at the Father Sheehan Section in 2005 and 2007-2014 and in the summer of 2015. Both spring and fall surveys were conducted in multiple sections in 2014 and 2015. Spring sampling was moved to summer starting in 2016. Summer sampling was done to document fish numbers and distribution during the period of warm water temperatures. The fall sampling was designed to represent a period when high water temperatures were no longer limiting to trout. Since 2015, sampling was conducted using two backpack electrofishers. From 2015-2018, we attempted to get population estimates (Zippin 1958) in both summer and fall, but this proved difficult in some sections due to low fish densities and deep water. Instead, we report counts of fish captured, standardized by electrofishing time (referred to as Catch Per Unit of Effort or CPUE). CPUE during fall through time can be found in Table 6. Starting in 2019, fish sampling was further complicated by an increase in discharge and water conductivity caused by releases of treated mine water in Butte. The high conductivity is due to the addition of lime during the treatment process, and this increase was significant enough to reduce the efficacy of using electrofishing to capture fish. Thus, fish capture data from 2019-present may not be directly comparable to previous years for sections downstream of Butte. To increase capture efficiency in 2020, a generator-powered, barge-mounted electrofishing unit was used on the German Gulch and Fairmont sections instead of backpack electrofishers. These two sections have especially fast water and deep pools that, combined with increased discharge and water conductivity, were very difficult to sample with backpack units.

Sampling summary

Three sections of Silver Bow Creek were sampled in 2025 (Table 9). Single pass backpack electrofishing samples were conducted at the LAO, Ramsay and Hwy 1 Bridge sections. The LAO and Ramsay sections have been surveyed annually in the fall since 2013. The HWY 1 Bridge section was last surveyed in 2022 (Figure 11).

Above Hwy 1 Bridge

Fall sampling on the Above Hwy 1 Bridge section started in 2013 and only 16 fish within three species were captured. In general, the number of fish captured, and species diversity has been increasing since regular monitoring began. Brook trout numbers in 2025 were the highest on record for this site. Large scale suckers and red side shiners were the two most abundant species in 2025. Westslope cutthroat trout have not been captured in this section since 2020, but rainbow trout have been present every year (Figure 11).

Ramsay Section

Suckers and sculpin were first found in the Ramsay section in 2005, and trout were first captured in fall 2007. Summer sampling at Ramsay started in 2016. The Ramsay section was characterized by moderately high trout densities during the fall and low densities during the summer through 2020. One brown trout was captured in the Ramsay section in fall of 2016, which is the only documented occurrence of brown trout in the Silver Bow basin upstream of a barrier near Fairmont constructed in 2017. The increase in discharge and water conductivity following the discharge of treated Berkeley Pit water began in 2019 brings into question whether electrofishing efficiency is affecting fish capture rates. Although the Ramsay section has held relatively high numbers of westslope cutthroat trout in the past during the fall, westslope cutthroat trout CPUE was down dramatically in fall of 2020 and no westslope cutthroat trout were captured in the section in 2021. This trend continued in 2022 and no westslope cutthroat trout were captured in the Ramsay section. Capture rates for brook trout and longnose suckers increased in 2022 so it appears that electrofishing efficiency may not be to blame for the lack of westslope cutthroat trout captures. More fish and fish species were captured in 2023 and the first westslope cutthroat trout was captured since 2020. Brook trout, Rocky Mountain sculpin and long nose sucker numbers have increased over the last several years while native westslope cutthroat trout have been nearly absent. Brook trout numbers in 2023 were the highest ever since sampling started in 2013 and nearly 10 times as many fish were captured compared to 2022. Many of the same trends continued in 2024. No westslope cutthroat trout were captured and brook trout numbers remained higher than the long-term average. Rocky Mountain sculpin are still the most abundant species while long-nose sucker numbers were lower than the past several years (Figure 11). In 2025, the same trends continued for most fish species with the exception being brook trout. The number of brook trout captured was the highest since sampling began in 2013, as we captured over three times the number of brook trout as the previous high (2023=51, 2025=164). These numbers are being driven by juvenile fish which suggest spawning and early recruitment are good but survival to adulthood is low.

LAO Section

Longnose suckers, sculpin, and central mudminnow were captured during the first survey of the LAO section in 2005. Brook trout were first captured at LAO in 2007 and westslope cutthroat trout in 2009. Brook trout have generally outnumbered westslope cutthroat trout in this section. Trout catch rates are higher during the fall sampling compared to summer sampling, suggesting trout move in and out of this part of Silver Bow Creek as conditions change with the seasons. Catch rates of brook trout, westslope cutthroat trout, longnose suckers, and rocky mountain sculpin in the fall of 2022 were within range of previous years' surveys. The number of fish captured in the LAO section decreased from 2022 to 2023 but are still within the range of previous years' surveys. The number of brook trout captured in 2024 was the highest number since regular sampling began in 2013. Westslope cutthroat trout captures remained low while Rocky Mountain sculpin captures were nearly triple past surveys and continue to be the most abundant species. The capture numbers in 2025 were very similar to those in 2024 (Figure 11).

Table 9. Electrofishing data collected in Fall 2025 from three sampling sections on Silver Bow Creek. Single pass backpack electrofisher CPUE and species composition. Species abbreviations: WCT = Westslope Cutthroat trout,

EB = Eastern Brook trout, RB = Rainbow trout, LN SU = Longnose sucker, LS SU = Large scale sucker, RM COT = Rocky Mountain Sculpin, CM MN = Central Mudminnow, RS SH = Redside shiner.

Section	Species	# Fish Handled	Mean Length (mm)	Length Range (mm)
Above Hwy 1 Bridge RM 7.9	CM MN	2	91	85-96
	EB	15	136	94-257
	LN SU	5	164	106-222
	LS SU	69	175	52-297
	RB	3	169	83-224
	RM COT	33	73	31-115
	RS SH	79	76	43-109
Ramsay RM 20.5	EB	164	117	80-256
	LN SU	11	102	64-139
	RM COT	83	79	43-114
LAO RM 27.4	CM MN	1		
	EB	13	194	113-284
	RM COT	131	84	55-112
	WCT	2	268	254-282

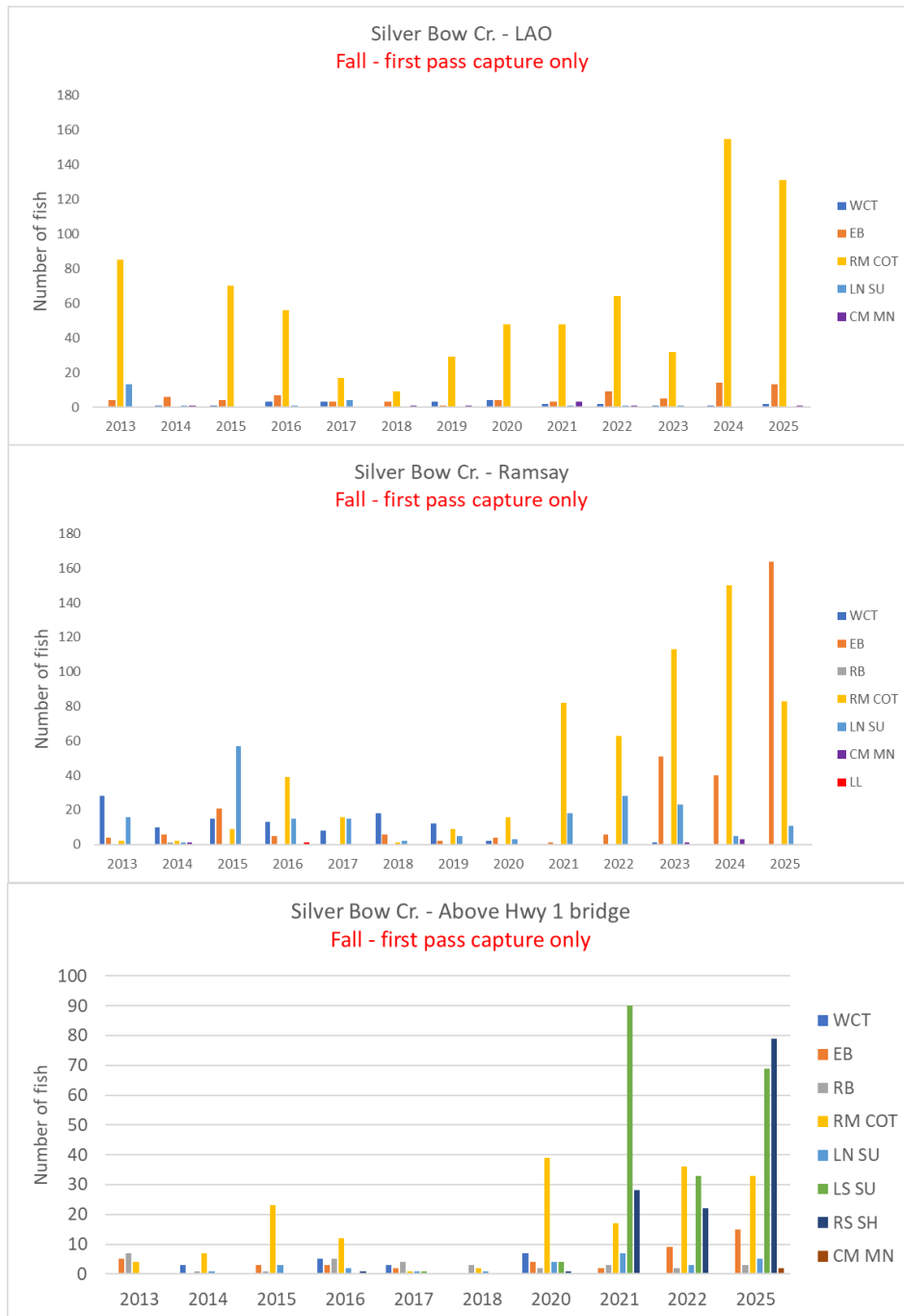


Figure 11. Fall single pass fish captures at three sites on Silver Bow Creek.

Discussion

Prior to the start of remedial actions in 1999, Silver Bow Creek was considered fishless. Suckers and sculpin first recolonized Silver Bow Creek followed by brook trout and westslope cutthroat trout. Tributaries were less impacted by mine waste and metals contamination and have served as a source of fish recruitment to mainstem Silver Bow Creek. German Gulch is a critical spawning stream for westslope cutthroat and brook trout. Given the high numbers of brook trout in the Father Sheehan

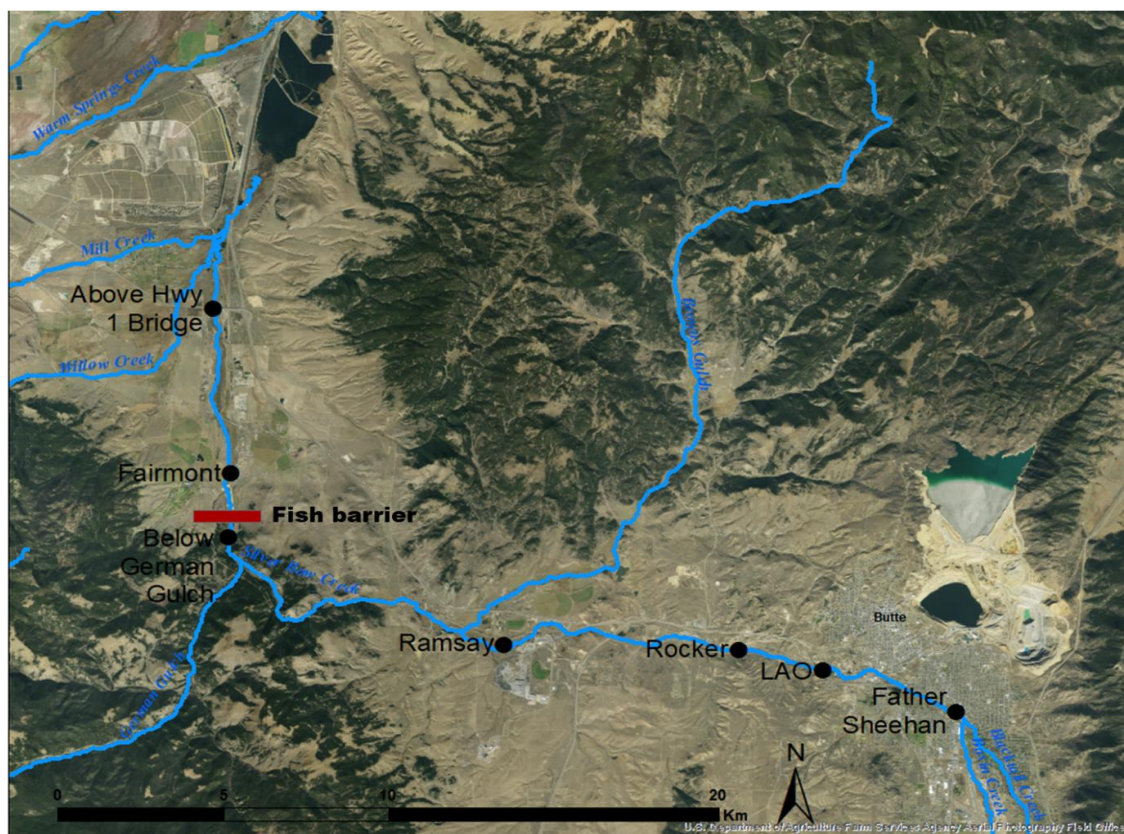
section, it is likely that Blacktail Creek is a source of trout to the upper reaches of Silver Bow Creek. Blacktail Creek is also a likely source of westslope cutthroat trout, which are common in the upper reaches of the tributary. A recent radio telemetry study showed westslope cutthroat trout using upper Blacktail Creek and tributaries for spawning. Compared to Father Sheehan, the LAO section holds far fewer trout, even though it is only about 3 miles downstream. At the Rocker section, which is about 2 miles downstream of LAO, trout are even less abundant. Cleanup of metals contamination has allowed fish to become established throughout Silver Bow Creek and enabled the establishment of substantial trout populations in certain parts of the creek (i.e., immediately downstream of German Gulch). However, habitat and water quality (i.e. temperature and dissolved oxygen) conditions in much of Silver Bow Creek within and immediately downstream of Butte are likely limiting factors for trout populations.

The Silver Bow Creek trout fishery is characterized by fish that concentrate near the mouths of German Gulch and Blacktail Creek. Westslope cutthroat trout especially concentrate in Silver Bow Creek near German Gulch in the summer because this tributary is a primary source of cold water. Westslope disperse away from German Gulch into areas such as Ramsay as water cools off during the fall. In the past, areas of Silver Bow Creek downstream of Butte have had low dissolved oxygen during hot summer nights (Naughton 2013), although DO conditions appear to have improved since the Butte wastewater treatment plant was improved in 2015 and 2016 (Nagisetty et al. 2019). However, nighttime DO concentrations are still dipping below water quality standards for typical trout bearing streams (i.e., 8 mg/L for class B streams: MT DEQ 2017). Limiting conditions in mainstem Silver Bow Creek should be investigated and eventually addressed to maximize the benefits of tributary restoration efforts on the mainstem fishery.

At the Ramsay section, fall catch rates of westslope cutthroat trout and brook trout in 2020 and 2021 were well below average. No westslope cutthroat were captured in 2021, which was the first fall sampling at Ramsay without westslope cutthroat since 2007. This trend continued in 2022 with no westslope cutthroat being captured. One westslope cutthroat was captured in 2023. No westslope cutthroat trout were captured in 2024 or 2025. Brook trout numbers have also normally been low with an average of six brook trout per section from 2013-2022. We captured 51 brook trout in 2023. The previous high was 21 brook trout in 2015. Brook trout numbers fell a little in 2024 (40) before exploding in 2025 (164). This section had better westslope cutthroat numbers during previous fall sampling periods, with an average of 15 per section from 2013-2019. It is unclear whether reduced electrofishing efficiency due to a 2-3X increase in specific conductivity is responsible for the reduction in CPUE. It is also possible that trout are avoiding this part of Silver Bow Creek due to changes in water chemistry. During baseflow conditions, flows in this part of Silver Bow Creek have been up to 50% treated water, much of which is treated Berkley Pit and mine system water. The effects of the Berkley Pit effluent, as well as effluent from municipal wastewater treatment should be thoroughly investigated.

Migratory fish, especially westslope cutthroat trout, provide a significant portion of the overall trout fishery in Silver Bow Creek. The importance of German Gulch as a source of migratory fish has been well established by tagging studies and population sampling. However, contributions of migratory individuals from other tributaries are not as well understood. As restoration efforts progress on Brown's Gulch, Basin Creek, and Blacktail Creek, monitoring could be conducted to determine the prevalence of migratory fish from these tributaries and identify remaining impediments to fish passage. Preliminary

results from a telemetry study conducted by FWP that began in 2023 showed migratory westslope cutthroat from Silver Bow Creek migrating to the upper reaches of the Blacktail Creek drainage to spawn. One individual also went into Browns Gulch during the spawning timeframe, but the spawning location was not documented. Further work is likely necessary to document how prevalent spawning activity in these two tributaries is, and how successful juveniles are at out-migrating from them. Blacktail Creek has several potential infrastructure barriers located between documented spawning locations and Silver Bow Creek. Flows during the spring of 2023 were generally high in Blacktail Creek, these barriers may not be navigable for fish during all flow years. Recruitment from all connected tributaries to Silver Bow Creek is important to long term health of the populations in the basin. However, until limiting factors (i.e., dissolved oxygen and temperature) in Silver Bow Creek are addressed the fluvial population and connectivity between populations will remain limited.



Map 2. Map of seven annual fish sampling sections on Silver Bow Creek.

Spotted Dog Creek

Four sections were sampled on Spotted Dog Creek in 2025 (Table 10). The lower two sections are in two areas of restoration work and have been sampled annually since 2020 to monitor fish response to restoration efforts. The upper two sites have been monitored consistently since 2018 and are being used as controls for the restoration reaches (Figure 12). The brook trout estimate was 103(56-150) fish/100 m and the westslope cutthroat trout estimate was 44(24-64) fish/100 m at the Restoration Phase 2 site. The brook trout estimate was 46(41-51) fish/100 m and the westslope estimate was 13(12-14) fish/100 m at the Upper BDA site. No other species were captured in the lowest section. Longnose

suckers were captured at the Upper BDA site. At the Below Forest Service site, the brook trout estimate was 94(84-104) fish/100 m and the westslope estimate was 86(78-94) fish/ 100 m. The uppermost site above the North Fork confluence had a brook trout estimate of 25(17-52) fish/100 m and a westslope estimate of 27(24-30) fish/100 m. Slimy sculpins were also present at both upper sites. Brook trout and westslope cutthroat trout estimates increased in all sections except for the Upper BDA section in 2025.

Table 10. Electrofishing data collected from four sections on Spotted Dog Creek in 2025. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope cutthroat trout, EB = Eastern Brook trout, LN SU = Longnose sucker, SL COT = Columbia Slimy Sculpin.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Restoration Phase 2 RM 8.0	EB	103(56-150)	70	132	91-208
	WCT	44(24-64)	34	146	85-220
Upper BDA RM 8.4	EB	46(41-51)	44	143	76-244
	WCT	13(12-14)	13	155	95-211
Below Forest Service RM 9.8	EB	94(84-104)	88	115	74-238
	WCT	86(78-94)	103	101	62-230
Above North Fork Confluence RM 11.3	EB	25(17-52)	17	95	75-162
	WCT	27(24-30)	68	78	44-175

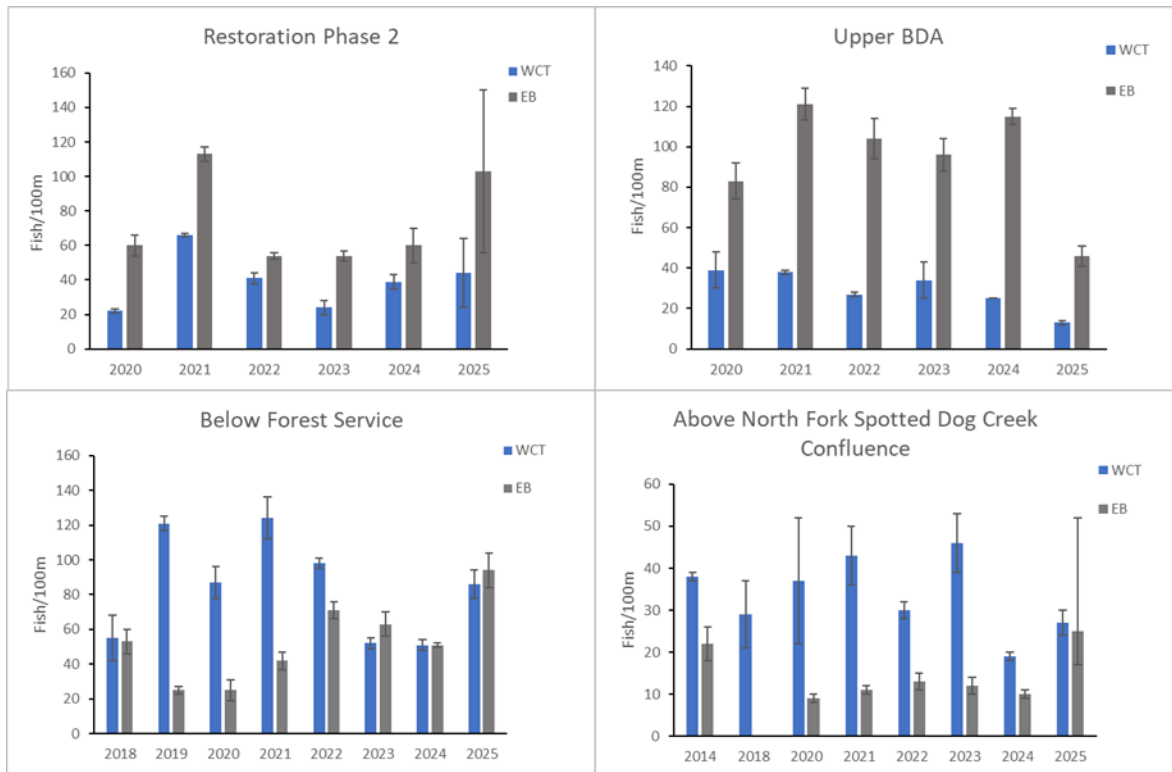


Figure 12. Depletion estimates of westslope cutthroat trout and brook trout at four sites on Spotted Dog Creek.

South Fork Spotted Dog Creek

Sampling on two sections of South Fork Spotted Dog Creek began in 2023 to get pre-restoration data for a Beaver Dam Analog (BDA) project (Table 11). The lower section is the BDA Treatment Reach, and the upper section is the BDA Control Reach (Figure 13). Depletion estimates have been conducted for the BDA Control Reach since 2023. The brook trout estimate for 2025 was 106(97-115) fish/100 m and the westslope cutthroat trout estimate was 26(25-27) fish/100 m. Estimates for this section seem stable and species composition hasn't changed. Estimates were not possible in the BDA Treatment Reach in 2024 or 2025. With the lack of water in 2024, water temperatures got too warm on the day we tried to conduct the survey. After restoration work, the pools in the section were too deep to sample effectively with backpack electrofishers. We did complete single pass surveys on the BDA Treatment Reach and captured the same number of westslope cutthroat trout all three years but fewer brook trout in 2024. Our capture efficiency was likely affected by the warm water temperatures in 2024 and deep pools in 2025.

Table 11. Electrofishing data collected on South Fork Spotted Dog Creek in 2025. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope cutthroat trout, EB = Eastern Brook trout, LN SU = Longnose sucker, SL COT = Columbia Slimy Sculpin.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
BDA Treatment Reach	EB		30	143	90-255
	WCT		8	149	89-240
BDA Control Reach	EB	113(104-122)	106	130	84-224
	WCT	37(32-42)	35	122	80-233

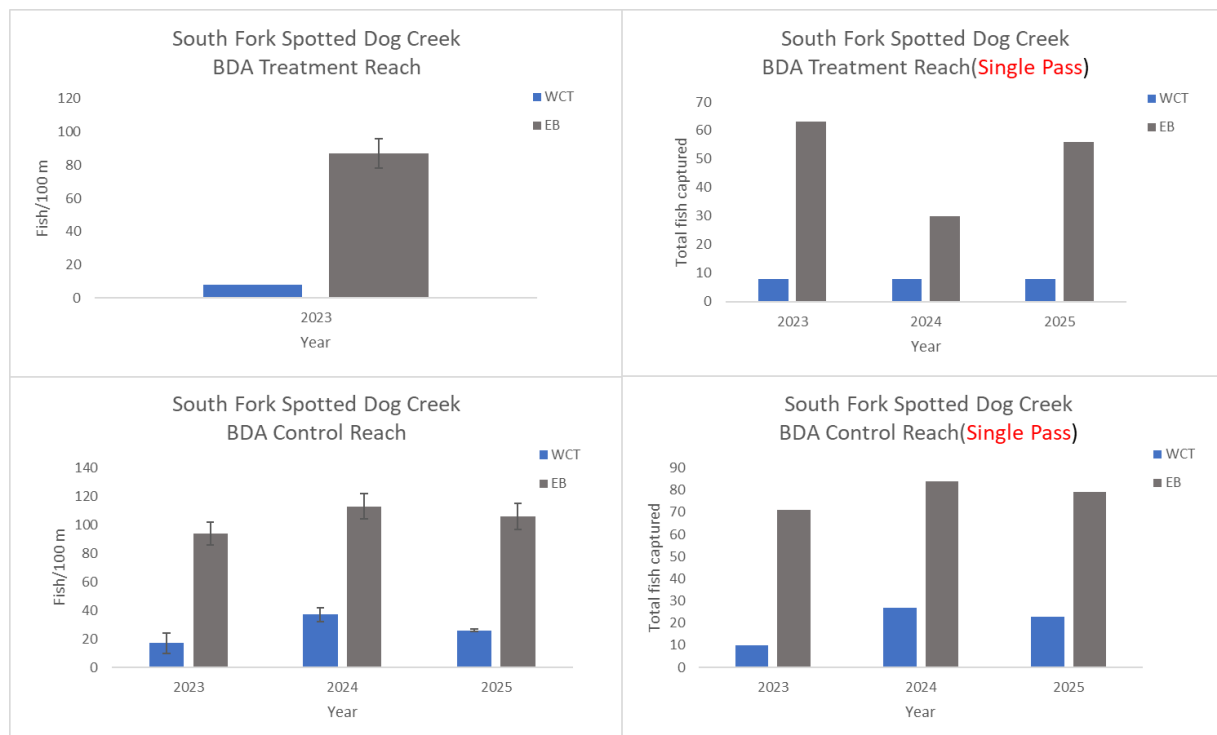


Figure 13. Depletion estimates and single pass surveys of westslope cutthroat trout and brook trout at two sites on South Fork Spotted Dog Creek.

Trout Creek

Two sections were sampled on Trout Creek in 2025 (Table 12). Westslope cutthroat trout were the most abundant fish species in both sections and brook trout were only present in the lower section (Figure 14). At the lower section the westslope cutthroat trout estimate was 109(103-115) fish/100m. Only five brook trout were captured at the lower site. The population estimate at the middle section for westslope cutthroat trout was 91(88-94) fish/100m and no brook trout were captured. These population estimates are the highest they have ever been in both sections.

Table 12. Electrofishing data collected on Trout Creek in 2025. Population estimates (95% CI) are for trout greater than 75 mm (~ 3") in total length. Species abbreviations: WCT = Westslope cutthroat trout, EB = Eastern Brook trout.

Section	Species	Population Estimate (Fish/100m)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Lower RM 4.5	EB		5	142	105-200
	WCT	109(103-115)	106	114	68-222
Middle RM 7.0	WCT	91(88-94)	91	103	70-234

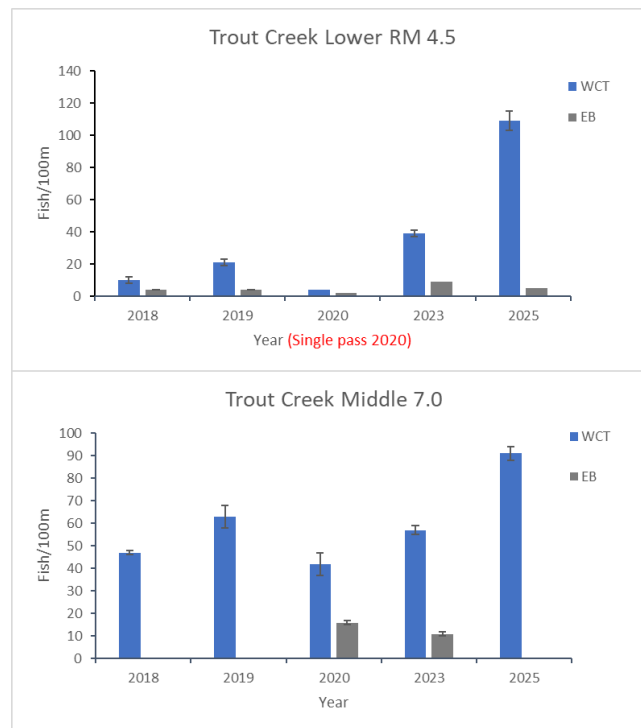


Figure 14. Depletion estimates of westslope cutthroat trout and brook trout at two sites on Trout Creek.

Flint Creek

Two sections were sampled on Flint Creek in 2025 (Table 13). The lowest site near the town of Hall had a brown trout estimate of 430(386-485) fish/km in 2025 which is up from 308(273-353) fish/km in 2024. Westslope cutthroat trout were also captured in the Hall section but not enough to produce a valid estimate. The Johnson Tuning Fork section, downstream of Phillipsburg, had a brown trout estimate of 395(355-447) fish/km, which is stable compared to past years data (Figure 15). We were able to produce a rainbow trout estimate of 19(15-35) fish/km, which is consistent with low numbers of *Oncorhynchus* in the section. Brown trout numbers continue to remain stable in Flint Creek over the past decade despite extreme drought conditions over that time.

Table 13. Electrofishing data collected on Flint Creek in 2025. Population estimates (95% CI) are for trout greater than 175 mm (~ 7") in total length. Species abbreviations: WCT = westslope cutthroat trout, LL = brown trout, RB = rainbow trout.

Section	Species	Population Estimate (Fish/Km)	# Fish Handled	Mean Length (mm)	Length Range (mm)
Hall	LL	430(386-485)	496	254	150-473
	WCT		4	290	222-370
Johnson Tuning Fork	LL	395(355-447)	356	275	159-470
	RB	19(15-35)	19	300	156-422
	WCT		3	325	270-370

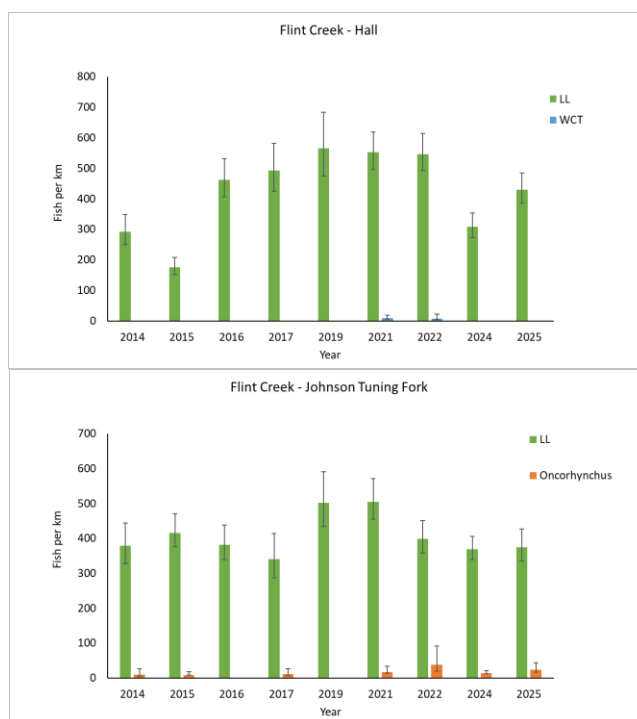


Figure 15. Mark and recapture estimates for two sections on Flint Creek.

Upper Clark Fork River Drainage Screw Traps

Introduction

The decline in brown trout populations in the upper reaches of the Upper Clark Fork River (UCFR) upstream of Deer Lodge is due to low recruitment of juvenile fish but the causes for the low recruitment are unknown. Factors affecting low recruitment could be poor spawning success, low production of early life stage trout to the river, or low survival of juvenile trout in the river. We proposed utilizing screw traps in large rearing tributaries in the UCFR to capture out-migrating juvenile trout and estimate production from those tributaries to the river. We also used traps as a method to capture juvenile fish for PIT tagging as part of a survival and movement study. We used 2025 as a pilot year to learn where we could effectively deploy screw traps, with the intent to incorporate this method into a graduate study beginning in 2026. This report summarizes data collected as part of this pilot study.

Methods

We utilized 1.5-meter screw traps for this study. Screw traps were placed in the Clark Fork River near tributary mouths or in tributaries themselves. Screw traps were deployed using a variety of rigging techniques, but all traps were deployed in the thalweg in places we anticipated efficiency would be high and the trap could operate across varying conditions. Traps were checked as frequently as necessary depending on debris load, generally once per day. All fish captured in the traps were identified to species and counted. Trout captured as young of the year (yoy) in the trap were identified to species and counted, trout age 1+ were counted, measured, and tagged with a PIT tag before being released. Flows were recorded for each day the trap was run from the nearest applicable public gauge station.

The most upstream trap was in the Clark Fork River at 46.18724, -112.76999, this trap was at the mouth of Warm Springs Creek and Silver Bow Creek. We intended to capture fish out-migrating from Warm Springs Creek, Silver Bow Creek and the Mill-Willow Bypass with this trap. We placed the trap at the confluence of these tributaries because the tributaries themselves are too small and inaccessible to place individual traps. Due to low capture rates at this trap, we ran efficiency tests using sucrose nodules following an established protocol (Kennen et al. 2011). Efficiency tests were performed infrequently but attempted to capture a range of flows. However, due to low water in-general flows were not very variable and there was no correlation of efficiency to flow rates. Therefore, average efficiency was calculated and used for the entire season.

The next most upstream trap was in Lost Creek about 150 meters upstream of the confluence with the Clark Fork River at 46.22676, -112.75969. This trap primarily caught age 1+ brown trout, with very few other species or yoy trout. Due to the lack of yoy trout and abundance of age 1+ trout, efficiency tests were performed by marking age 1 brown trout and moving them upstream to the face of a beaver dam about 100 meters upstream of the trap. We assumed all marked fish attempted to move back downstream of the trap by the following day. Due to a lack of variability in flows in lower Lost Creek and the limited flow range the trap was able to function in, an average efficiency was calculated and used for the entire season. We considered 25 CFS measured at the USGS Lost Creek near Galen gauge (USGS 12323850) to be the minimum operable flow for this trap and the trap was not run on days when flows were less.

The most downstream trap was in Gold Creek, downstream of the impacted reach of the Clark Fork River. Gold Creek is known to be a prominent source of recruitment for the Clark Fork River and served as a reference site for the trap in the impacted reach of the Clark Fork River (Cook and Bourett 2022). The trap was located about 400 meters upstream of the confluence with the Clark Fork River at 46.58152, -112.91003. This location is downstream of most of the documented spawning activity in Gold Creek. The Gold Creek trap caught primarily yoy brown trout with a smaller proportion of age 1+ brown and cutthroat trout. The trap never captured enough 1+ trout to run an efficiency test. Efficiency tests were ran regularly using yoy fish died with Bismark Brown-Y powdered dye. 0.2 grams of powder was dissolved in 250 ml of water to ensure the powder was completely dissolved prior to testing. The dissolved solution was then poured into one gallon of water and fish were submerged for about 30 minutes. Fish were then moved to a bucket of clean water and allowed to recover. Fish were then released 100 meters upstream of the trap and it was assumed all fish attempted to move back downstream of the trap by the next day. Dye efficiency tests covered a range of flows but there was no significant correlation between flow and efficiency of the trap, so an average of all efficiency tests was used for the entire season.

Results

The Clark Fork River trap at the confluence of Warm Springs Creek and Silver Bow Creek ran for 59 days between 4/10/2025 and 7/9/2025. The trap ran in conditions from 68 to 386 cfs measured at the USGS Gauge at Galen (USGS 12323800). Capture efficiency was calculated at 27% of total outmigration of sucrose nodules. Total outmigration of brown trout past the trap ranged from 0 to 533 daily across the range of dates the trap ran, with yoy ranging from 0 to 456 and age 1+ from 0 to 77 daily. Cumulative outmigration from the days the trap was run totaled 2689 brown trout, or 46 fish per day (Figure 1). We tagged a subset of 99 of the age 1+ brown trout captured in the Clark Fork River trap with PIT tags.

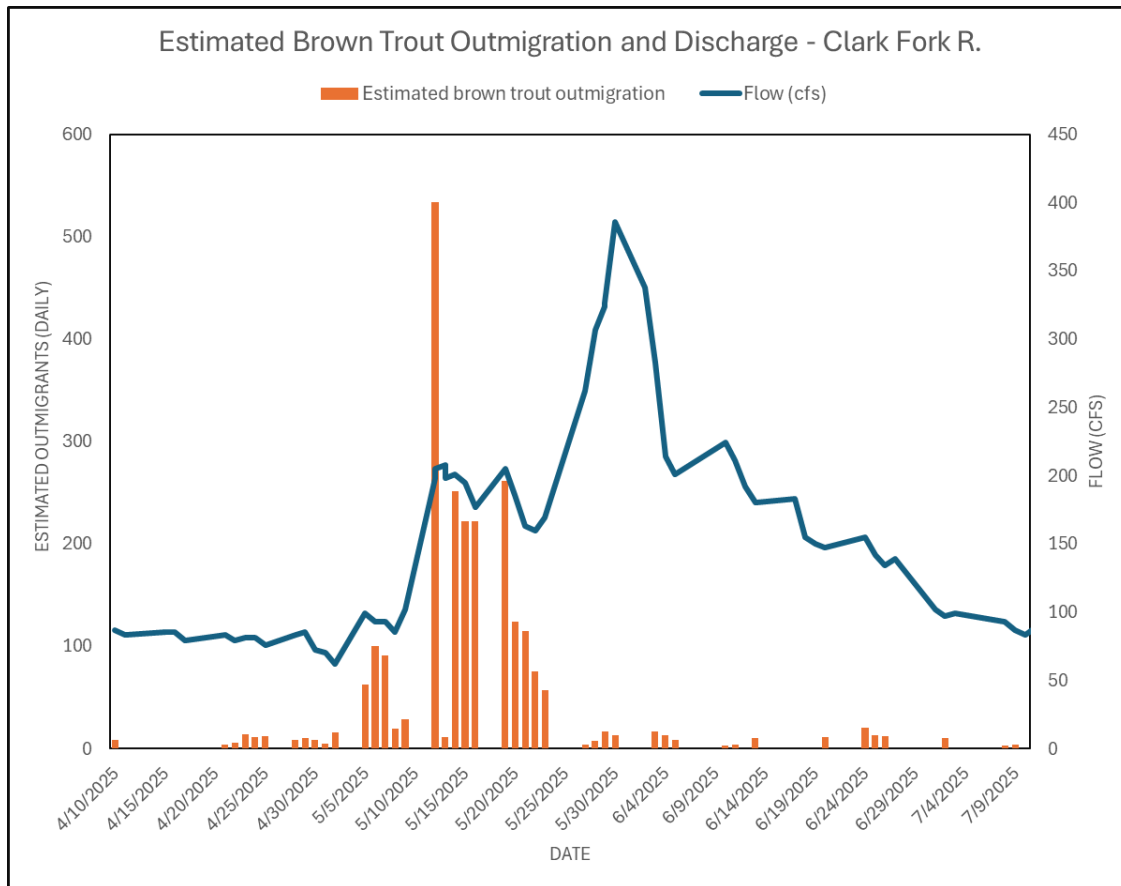


Figure 16. Estimated total outmigration of brown trout at the Clark Fork River trap across the range of dates the trap was run plotted with discharge at the USGS Galen gauge.

The Lost Creek trap was run most days when conditions were suitable between 4/10/2025 and 5/21/2025, the trap operated a total of 25 days. The trap ran in conditions from 26 to 45 cfs measured at the USGS Lost Creek near Galen gauge (USGS 12323850). Capture efficiency was calculated at 15% of total outmigration of age 1 brown trout, this capture efficiency was also applied to yoy captures. Total outmigration of brown trout past the trap ranged from 0 to 1107 daily across the range of dates the trap ran, there was only one day that 0 brown trout were captured. Age 1+ outmigration ranged from 0 to 518 daily, and yoy from 0 to 819 daily. We only observed yoy fish in the trap on three of the 25 days the trap was operated. Cumulative outmigration from the days the trap was run totaled 5215 brown trout, or 209 fish per day (Figure 2). We tagged a subset of 512 of the age 1+ brown trout captured in the Lost Creek trap with PIT tags.

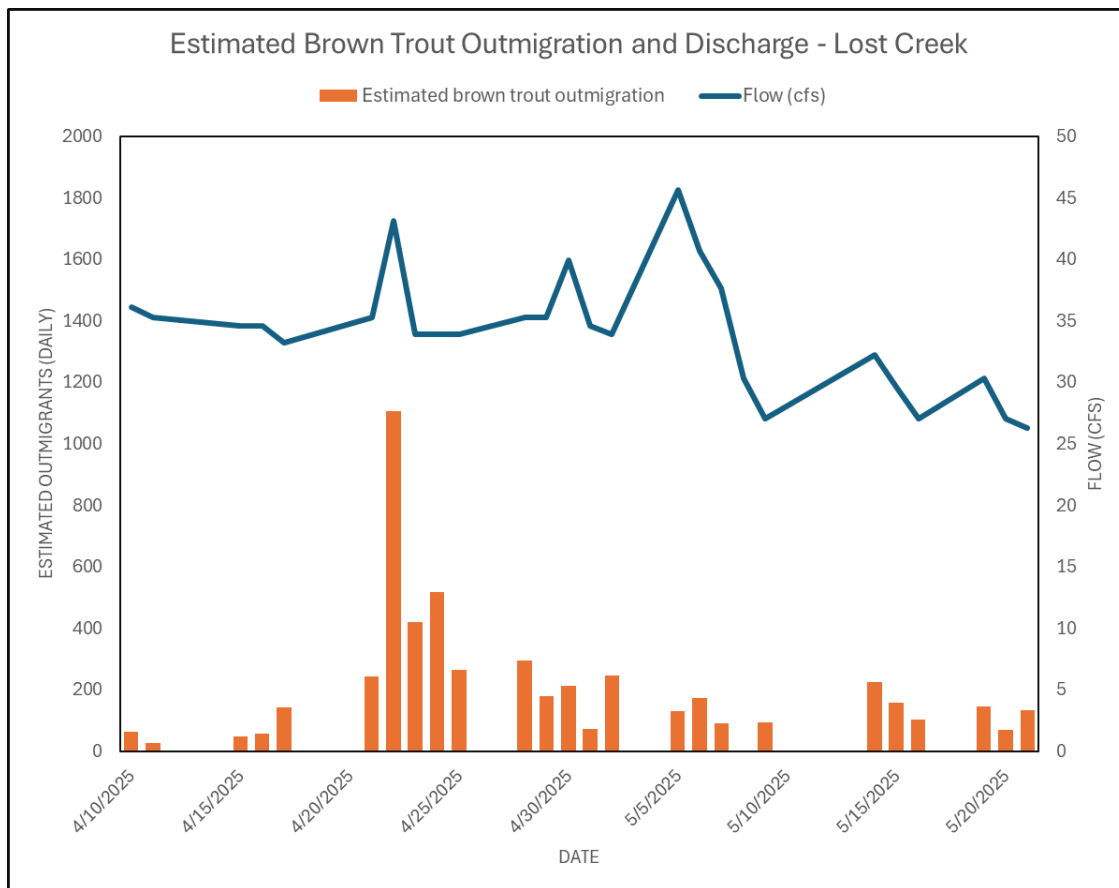


Figure 17. Estimated total outmigration of brown trout at the Lost Creek trap across the range of dates the trap was run plotted with discharge at the USGS Lost Creek near Galen gauge.

The Gold Creek trap was run most days when conditions were suitable between 6/2/2025 and 7/11/2025, the trap operated a total of 26 days. The trap ran in conditions from 20 to 40 cfs measured at the Montana DNRC StAGE Gold Creek near Gold Creek, MT gauge (76G 05850). Capture efficiency was calculated at 25% of total outmigration of yoy brown trout, this capture efficiency was also applied to age 1+ captures. Total outmigration of brown trout past the trap ranged from 0 to 960 daily across the range of dates the trap ran. Age 1+ outmigration ranged from 0 to 144 daily, and yoy from 0 to 909 daily. We observed and fixed an issue with one of the gaskets on the trap on 6/24/2025 that was likely allowing yoy fish to escape the trap. We do not know when the issue developed but our data would suggest it may have occurred shortly after the trap began running, likely sometime on 6/5/2026. This issue likely heavily impacted capture rates between 6/5 and 6/24. Cumulative outmigration from the days the trap was run totaled 3383 brown trout. During the 13 days the trap was fully functional we captured 3323 fish, or 256 per day (Figure 3).

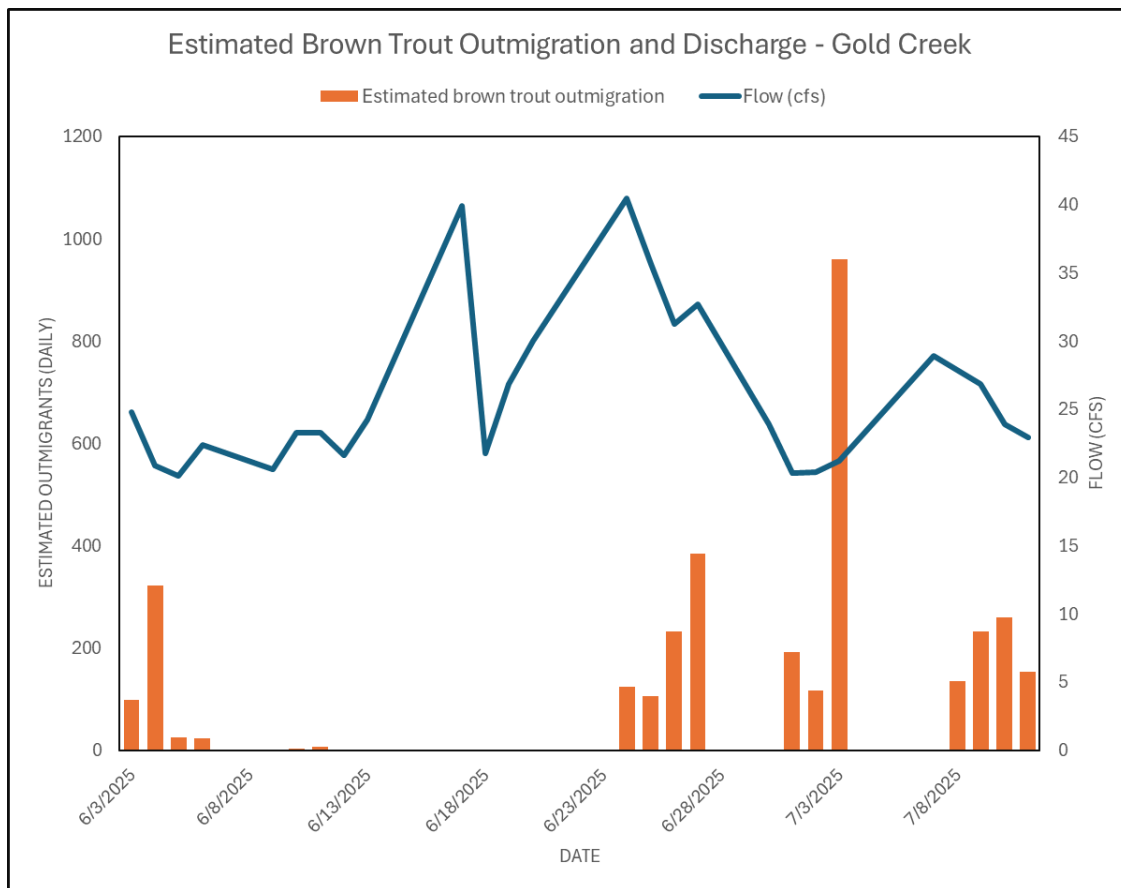


Figure 18. Estimated total outmigration of brown trout at the Gold Creek trap across the range of dates the trap was run plotted with discharge at the DNRC StAGE Gold Creek Creek near Gold Creek, MT gauge. The trap was not functioning properly from 6/5 to 6/24.

Discussion

Screw traps run in 2025 were deployed as part of a pilot study to test methods for a graduate study beginning in 2026, and to capture and tag age 1 brown trout to study emigration out of the impacted reach of the Clark Fork River. Refer to the Upper Clark Fork River Emigration Study section (pg. 36-39) of this report for results and discussion related to the 611 brown trout PIT tagged from the Lost Creek and Clark Fork River screw traps.

The Clark Fork River trap ran for the longest and most consistent period. The trap struggled from low samples size of age 1 trout and a short window (two weeks in mid-May) for larger sample sizes of yoy brown trout. We never captured enough age 1 fish in a single day to run an efficiency test with live age 1 fish. We captured enough yoy on several occasions in mid-May to run an efficiency test but the only way to mark yoy for an efficiency test was by using a dye. During May and early June, we tested several dye methods proved on other species and life stages of fish in various studies but found them to be incompatible with yoy brown trout. We determined powder form Bismark Brown-Y was a safe and effective method for marking juvenile brown trout by mid-June. We never captured enough yoy again at this trap to run an efficiency test on live yoy. We settled on efficiency tests using sucrose nodules, which were sufficient for pilot work but likely has too many limitations for application in future studies. Specifically, the trap covers more of the river's surface area than overall water column area and

therefore the floating sucrose nodules likely significantly overestimate efficiency vs live fish. This method also does not account for potential trap avoidance, which may be a prominent factor in age 1+ fish.

Relatively low numbers of fish were observed in the Clark Fork River trap (46 per day), compared to Lost Creek (209 per day) and Gold Creek (256 per day). The exception to this was the first increase in flows over base-flow in mid-May when higher numbers of yoy were observed in the Clark Fork River trap. We observed the same spike in outmigration with the first increase in flows at the Lost Creek trap also, the Gold Creek trap was deployed well after the first flow increases of the year. We determined low capture rate at the Clark Fork River trap was likely due to either low efficiency on live fish or a lack of outmigrants coming past the trap. We identified a location for a trap in lower Warm Springs Creek that can be run concurrently with this trap in 2026 to determine if poor efficiency is the issue. Low numbers of fish at the Clark Fork River trap that captures fish out-migrating from Mill-Willow bypass and Warm Springs Creek does align with results from a 2022 otolith microchemistry study that looked at recruitment sources of fish living in the Upper Clark Fork River (Elam et al, 2023). The study found that of 105 fish captured in the Clark Fork River upstream of Deer Lodge, MT in the vicinity of the Lost Creek and Clark Fork River traps, 7.6% and 20.9% were born in Warm Springs Creek and the Mill-Willow Bypass respectively, while 31.4% were born in Lost Creek. The same study found that 39.6% of 48 fish captured in the Clark Fork River in a section near Gold Creek were born in Gold Creek. We plan to deploy screw traps and run efficiency tests using other methods in future years to determine if the lack of production at the Clark Fork River trap is from poor efficiency or low outmigration past the site.

The Lost Creek and Gold Creek Traps were more productive than the Clark Fork River trap but were hampered by site specific conditions and late deployment that limited the length of the season we were able to sample. We intend to deploy these traps for longer periods of time in future years as part of a graduate study to examine the magnitude of recruitment from these tributaries, and PIT tag fish to study survival. These sites both appear to be suitable for screw traps but are constrained by flow limitations that will limit operating times in poor flow years. During this pilot work we identified the most suitable locations and accompanying minimum flows for operating screw traps in the desired tributaries, tested suitability of various methods for efficiency tests, and tagged 611 fish that were used in an emigration study. We also observed that the most prominent outmigration event might be triggered by the first runoff event of the spring, it will be important to have traps operating during this window to accurately characterize outmigration. We will utilize this information and various other lessons learned to successfully implement a recruitment and survival study beginning in 2026.

Upper Clark Fork River Emigration Study

Introduction

The decline in brown trout populations in the upper reaches of the Upper Clark Fork River upstream of Deer Lodge are due to a lack of recruitment of juvenile fish but the causes for the lack of recruitment are unknow. One hypothesis for the lack of recruitment in this area specifically is that poor water quality, simplified habitat, or a combination of these and other factors causes juvenile fish to emigrate from the

reach. We proposed utilizing PIT tagged fish and strategically placed antennas to understand emigration rates of fish tagged in the reach or entering this reach.

Methods

Brown trout were tagged in the Upper Clark Fork River and entering the river from two tributaries in the spring of 2025. The fish tagged in the river were captured using electrofishers, the fish captured migrating to the river from tributaries were captured using rotary screw traps. Fish were tagged with 14mm PIT tags in the body cavity using a ventral side incision. Fish <250mm at tagging were considered juvenile fish for this analysis and >250mm were considered adults based on aging of brown trout otoliths collected from the Clark Fork River (Table 1).

Table 14. Proportion of brown trout per each 25 mm length class. These proportions are used to estimate the number of brown trout in each age class from our population estimates.

Length group	Proportion per age class					
	1	2	3	4	5	6
75	1	0	0	0	0	0
100	0.875	0.125	0	0	0	0
125	0.4375	0.5625	0	0	0	0
150	0	1	0	0	0	0
175	0	1	0	0	0	0
200	0	1	0	0	0	0
225	0	0.625	0.375	0	0	0
250	0	0	1	0	0	0
275	0	0	1	0	0	0
300	0	0	1	0	0	0
325	0	0	0.2	0.8	0	0
350	0	0	0.5	0.5	0	0
375	0	0	0	1	0	0
400	0	0	0	1	0	0
425	0	0	0	0.5	0.5	0
450	0	0	0	0	1	0
475	0	0	0	0	0	1
500	0	0	0	0	0	0

PIT antennas were set up at three locations in the Clark Fork River and in three prominent tributaries. Locations of antennas in the river are downstream of Sager Lane, directly downstream of Gemback Road Bridge, and directly downstream of the confluence of Silver Bow Creek and Warm Springs Creek. Antennas were also installed in Warm Springs Creek, Lost Creek, and Racetrack creek near the mouths. Antennas were set up using a paired method to enable us to determine antenna efficiency and direction of movement. Antennas were monitored and maintained from April of 2025 through August of 2025 for this study.

Results

We considered the impacted reach to be from the confluence of Silver Bow Creek and Warm Springs Creek on the upstream end to downstream of Sager Lane on the downstream end. We analyzed fish tagged in seven separate groups to determine how many juvenile and adult fish left the impacted reach from April-August. The six groups of fish are pH Shack Screw Trap, pH Shack River Section, Perkins Lane

to Galen Bridge, Lost Creek Screw Trap, Racetrack Creek Tagging, Below Sager Lane, and Racetrack Bridge to Huey Long.

In total, 1,630 juvenile brown trout were tagged in the Clark Fork River and two tributaries during spring sampling, screw trap operation and targeted backpack electrofishing. We observed 127 of the 1,117 (11%) juvenile brown trout that were tagged in or entered the river left the impacted reach from May-July. We tagged 329 adult brown trout in the Clark Fork River in the impacted reach. We observed 44 of 329 (13%) exited the impacted reach from May-July.

pH Shack Screw Trap

99 juvenile brown trout were captured and tagged in the pH Shack screw trap. Three of these fish left the impacted reach downstream between May and July. Fifteen fish left the impacted reach either upstream or into a tributary from May to July. 18% of the tagged juvenile brown trout left the impacted reach from May to July.

pH Shack River Section

470 juvenile brown trout were tagged in the pH Shack monitoring section during spring sampling. Seven of these fish left the impacted reach downstream between April and August. Fifty-two fish left the impacted reach either upstream or into a tributary from April to July. 13% of the tagged juvenile brown trout left the impacted reach from April to August.

56 Mountain Whitefish were tagged in the pH Shack monitoring section during spring sampling. No whitefish left the impacted reach downstream. Thirty whitefish left the impacted reach either downstream or into a tributary from April to July. 54% of tagged whitefish left the impacted reach from April to July.

63 adult brown trout were tagged in the pH Shack monitoring section during spring sampling. One adult left the impacted reach downstream in May. Twenty-nine adults left the impacted reach upstream from April to June. 48% of the tagged adult brown trout left the impacted reach from April to June.

Perkins Lane to Galen Bridge Section

121 juvenile brown trout were tagged in the Perkins Lane to Galen Bridge monitoring section during spring sampling. No tagged fish left the impacted reach downstream. Fourteen fish left the impacted reach either upstream or into a tributary from May to July. 12% of the tagged juvenile brown trout left the impacted reach from May to July.

97 adult brown trout were tagged in the Perkins Lane to Galen Bridge monitoring section during spring sampling. One adult left the impacted reach downstream in May. Five adults left the impacted reach upstream from May to July. 6% of the tagged adult brown trout left the impacted reach from May to July.

Lost Creek Screw Trap

512 juvenile brown trout were captured and tagged in the Lost Creek screw trap. 299 of these were detected on the Lost Creek PIT antenna and were considered to have entered the impacted reach of the Clark Fork River. Sixteen fish left the impacted reach downstream from May to July. Sixteen fish left the

impacted reach upstream from May to July. 11% of the tagged brown trout that entered the Clark Fork River left the impacted reach from May to July.

Racetrack Creek

159 juvenile brown trout were captured and tagged in Racetrack Creek. Seventy-nine of these were detected on the Racetrack Creek PIT antenna and were considered to have entered the impacted reach of the Clark Fork River. No fish left the impacted reach downstream. One fish left the impacted reach upstream in June. 1% of the tagged fish that entered the Clark Fork River left the impacted reach in June.

Racetrack Bridge to Huey Long's Section

25 juvenile brown trout were captured and tagged in the Racetrack Bridge to Huey Long's section. No fish left the impacted reach downstream. Two fish left the impacted reach either upstream or into a tributary from May to July. 8% of the tagged juvenile brown trout left the impacted reach from May to July.

80 adult brown trout were captured and tagged in the Racetrack Bridge to Huey Long's section. Two fish left the impacted reach downstream from May to July. Two fish left the impacted reach into a tributary from May to July. 5% of the tagged adult brown trout left the impacted reach from May to July.

Below Sager Lane Section

24 juvenile brown trout were captured and tagged in the Below Sager Lane section. Five of these left the impacted reach downstream from April to May. No fish left the impacted reach upstream or into a tributary. 21% of the tagged juvenile brown trout left the impacted reach from April to May.

89 Adult brown trout were captured and tagged in the Below Sager Lane section. Four fish left the impacted reach downstream From May to August. One fish left the impacted reach into a tributary in May. 6% of the tagged adult brown trout left the impacted reach from May to August.

Discussion

One of the goals of the PIT tag project is to determine if brown trout are leaving the impacted reach. The preliminary results suggest that most tagged fish have remained in the impacted reach. This initial season of data indicates a significant number of juvenile fish remained or died in the impacted area throughout the summer. We observed similar levels of emigration from the juvenile and adult trout which may suggest the 11% observed in juveniles is normal trout movement rather than habitat or water quality selection.

The combination of a small number of brown trout moving out of the area and population estimates of older brown trout remaining low suggests that survival or production of younger brown trout may be low and ultimately the reason for low recruitment. We plan to continue to collect emigration data over the next two years to observe patterns over a broader spectrum of conditions and time. We will also be partnering with a master's student at Montana State University to utilize tagged fish to calculate survival rates in juvenile fish in the impacted reach of the Clark Fork River.

Upper Clark Fork River Drainage Caged Fish

Introduction

The decline in brown trout populations in the upper reaches of the Upper Clark Fork River (UCFR) upstream of Deer Lodge is due to low recruitment of juvenile fish but the causes for the low recruitment are unknown. Factors affecting low recruitment could be poor spawning success, low production of early life stage trout to the river, or low survival of juvenile trout in the river. We completed an otolith microchemistry study prior to the trout population decline that showed fish living in the river were born in both tributaries and the mainstem river (Cook and Bourett 2022). However, a more recent otolith microchemistry study suggested that since the trout decline, most of the juvenile fish captured in the river were of tributary origin (Elam et al. 2023). We hypothesized this might indicate that juvenile fish are not living long in the river and therefore the few juveniles present are recent outmigrants from tributaries.

We proposed utilizing caged fish in control and impacted areas throughout the UCFR to understand when and where high rates of mortality might be occurring. A previous caged fish study was completed in the UCFR from 2011 to 2015 before the fish population declined, but the study was hampered by prominent cage effect mortality skewing results (Cook et al. 2015). We used the 2025 field season to pilot new cage techniques that could be utilized as part of a graduate study the following years if successful. This report summarizes data collected as part of this pilot study.

Methods

Cages were built using three 54L coolers per site, two test coolers and a stock cooler. Each cooler was outfitted with a screened standpipe style drain that kept water levels the same across the three coolers. The coolers were all fed with water pumped through ½" pipe from the same 500 gallon per hour 12v pump housed in a box made of screen panels in the river. The power supply for the pump came from two 100-amp hour lithium batteries charged by two 100-watt solar panels. Cages were in areas with accessible deep slow-moving water, a nearby area suitable for solar power, and a flat bank where cages were at the same elevation and level. Cages were deployed near long term temperature monitoring sites.

Cages were deployed at two locations along the Clark Fork River, and one in Warm Springs Creek. The three locations were: Warm Springs Creek at Warm Springs (46.18678, -112.77231), Clark Fork River at Warm Springs (46.18725, -112.7699) from 7/2/2025 through 2/21/2026, and Clark Fork River at Racetrack (46.28852, -112.72458) from 7/2/2025 through 10/31/2025. Only the two cages located at Warm Springs were run through the winter. Cages were stocked with 30 fish each using young of the year (yoy) brown trout captured using backpack electrofishers in various sections of the Mill-Willow bypass. Cages were checked daily for dead fish and to feed and clean cages. A commercial hatchery fish food appropriate for the size fish in the cages was used. When a dead fish was observed in a test cage it was immediately removed and replaced with a fish from the stock cages to always maintain 30 fish in each test cage. Once the stock cage was out of fish at one location and a test cage dropped below 30 fish the experiment was restarted following the same stocking protocol.

Results

The Warm Springs Creek at Warm Springs trap was run from 7/1/2025 through 1/1/2026. The traps were re-stocked with fish on three occasions. The three distinct experimental periods were: early July (7/1/25-7/14/25), late July and August (7/15/25-8/25/25), and fall to early winter (9/9/25-1/1/26). We never utilized all stock cage fish at this location during any of the three times, the experiment was always re-set due to stock cage depletion at one of the other sites. Overall mortality was low at this site with the highest mortality rates occurring during the first two periods when 2.6 total mortalities were observed per week. The highest cumulative mortality in a test cage during an individual week was six fish in Cage 1 during the week of 8/19-8/25. We only observed three total mortalities from 9/9/25 through 1/1/26. We did not observe any cage effect mortality occur at this location (Figure 1). We observed temperatures ranging from 5.1 to 21.0 degrees Celsius during the study at the nearby temperature monitoring location (Figure 2).

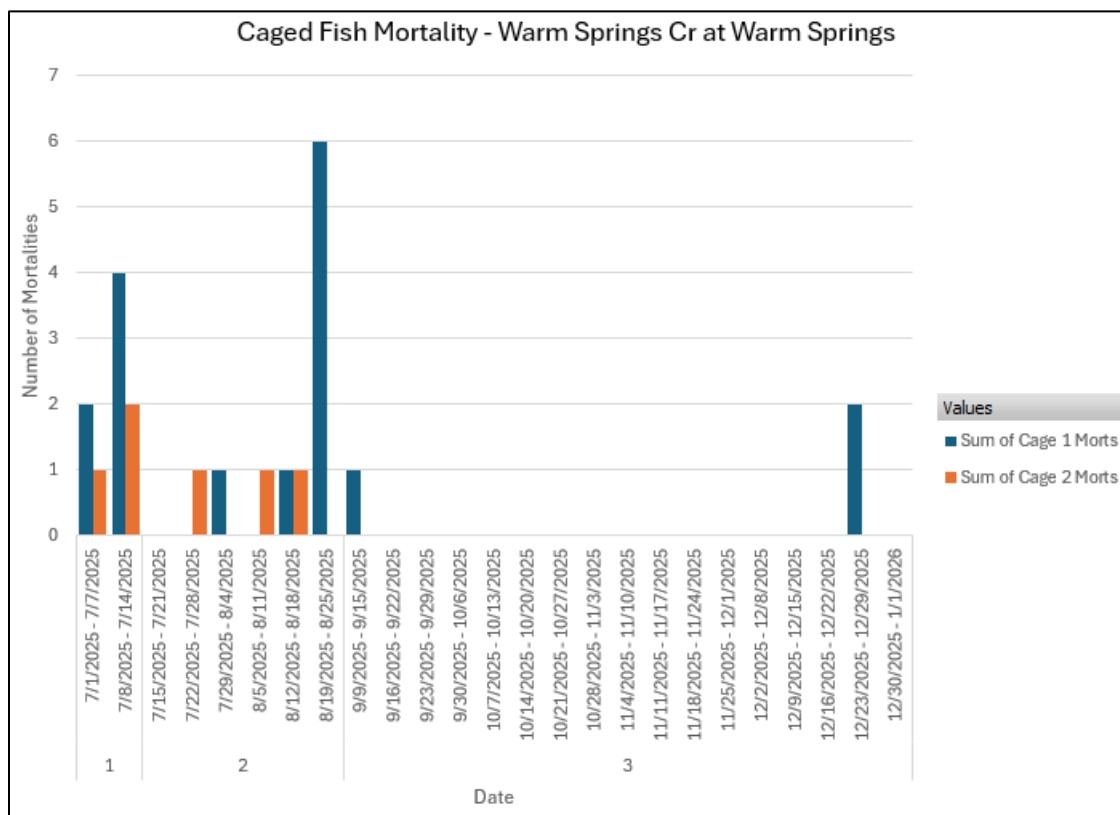


Figure 19. Weekly mortality rates in test cages at the Warm Springs Creek at Warm Springs site.

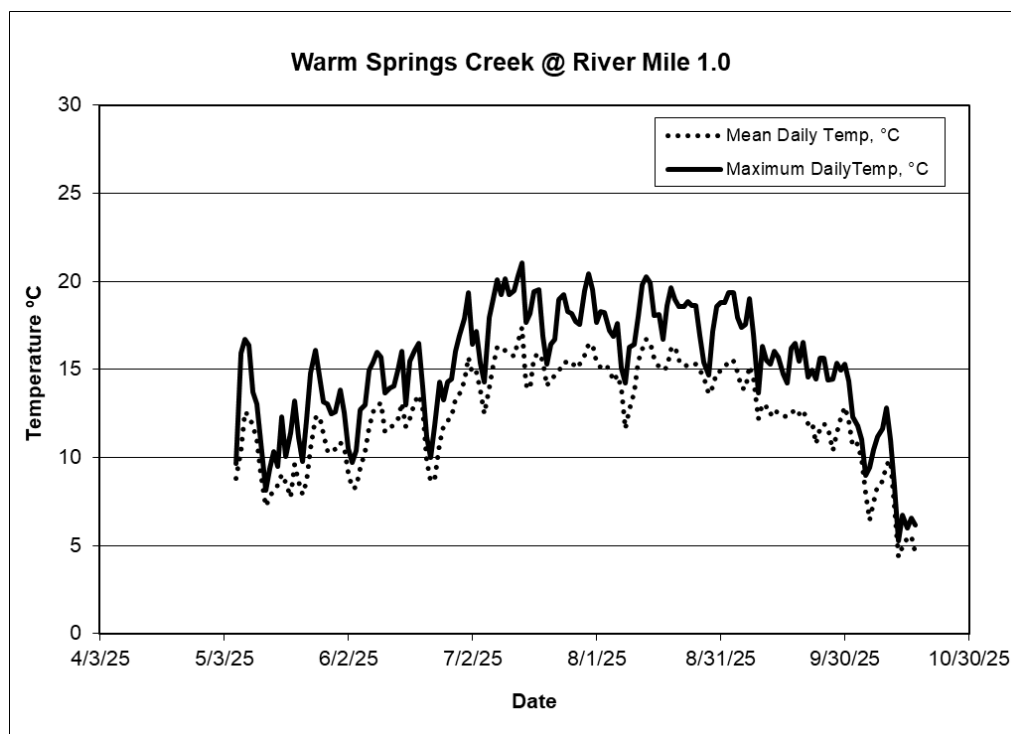


Figure 20. Mean and maximum daily temperatures recorded upstream of the Warm Springs Creek cage location from May to October of 2025.

The Clark Fork River at Warm Springs trap was run from 7/2/2025 through 2/21/2026. The traps were re-stocked with fish on four occasions. The four distinct experimental periods were: early July (7/1/25-7/15/25), late July and August (7/16/25-8/26/25), September to early October (9/3/25-10/7/25), and mid-October to late February (10/8/25-2/21/26). Overall mortality was moderate at this site with the highest mortality rates occurring during the first two periods when an average of 11 and 7.8 total mortalities were observed per week respectively. The highest cumulative mortality in a test cage during an individual week was 14 fish in Cage 1 during the week of 8/20-8/26. The third period was ended when most fish died the week of 10/1-10/7 due to a pump failure. We only observed three total mortalities from 9/9/25 through 1/1/26. The fourth period had no mortality for the first 10 weeks, mortality began in early December and was low but consistent until the end of the period. Cage effect mortality was low to not present other than some possible low level cage effect in December and January in cage 2 (Figure 3). We observed temperatures ranging from 5.8 to 23.2 degrees Celsius during the study at the nearby temperature monitoring location. Temperature sensors were not active during most of the last period (Figure 4).

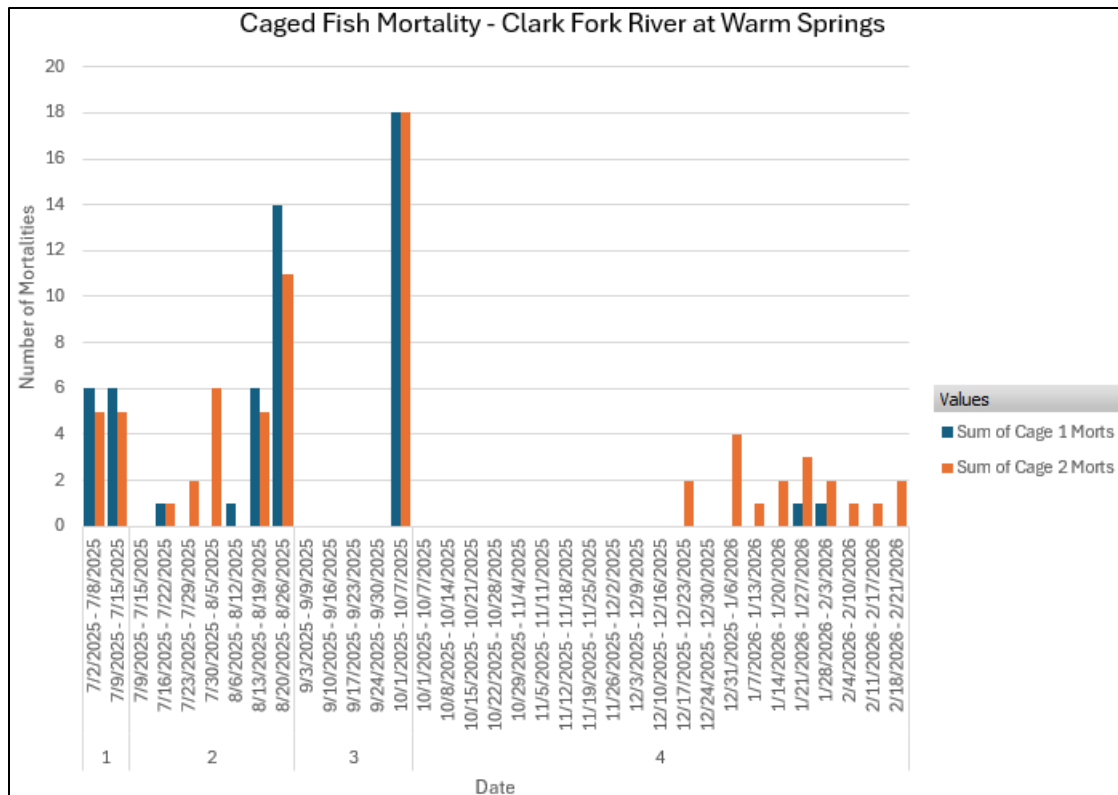


Figure 21. Weekly mortality rates in test cages at the Clark Fork River at Warm Springs site.

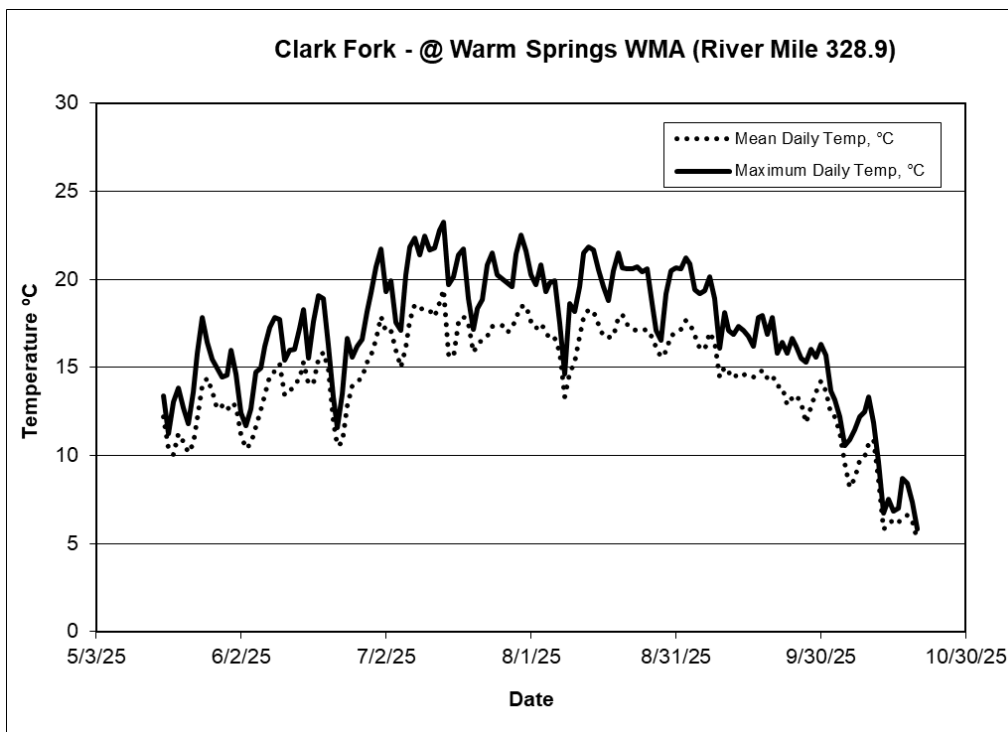


Figure 22. Mean and maximum daily temperatures recorded near the Clark Fork River at Warm Springs cage location from May to October of 2025.

The Clark Fork River at Racetrack trap was run from 7/2/2025 through 10/31/2025. The traps were restocked with fish on three occasions. The three distinct experimental periods were: early July (7/2/25-7/15/25), late July to early August (7/16/25-8/5/25), and September and October (9/10/25-10/31/25). Mortality was relatively high at this site with the highest mortality rates occurring during the first two periods when an average of 17.5 and 22.3 total mortalities were observed per week respectively. The highest cumulative mortality in a test cage during an individual week was 27 fish in Cage 1 during the week of 7/9-7/15. Mortality was relatively low in the third period with 1.5 mortalities per week on average. Cage effect mortality was an issue at this site, 27 fish died in cage 1 the week of 7/9-7/15 while only 3 died in cage 2, and 24 fish died in cage 2 the week of 7/23-7/29 while only 1 died in cage 1 (Figure 5). We observed temperatures ranging from 6.5 to 25.0 degrees Celsius during the study at the nearby temperature monitoring location (Figure 6).

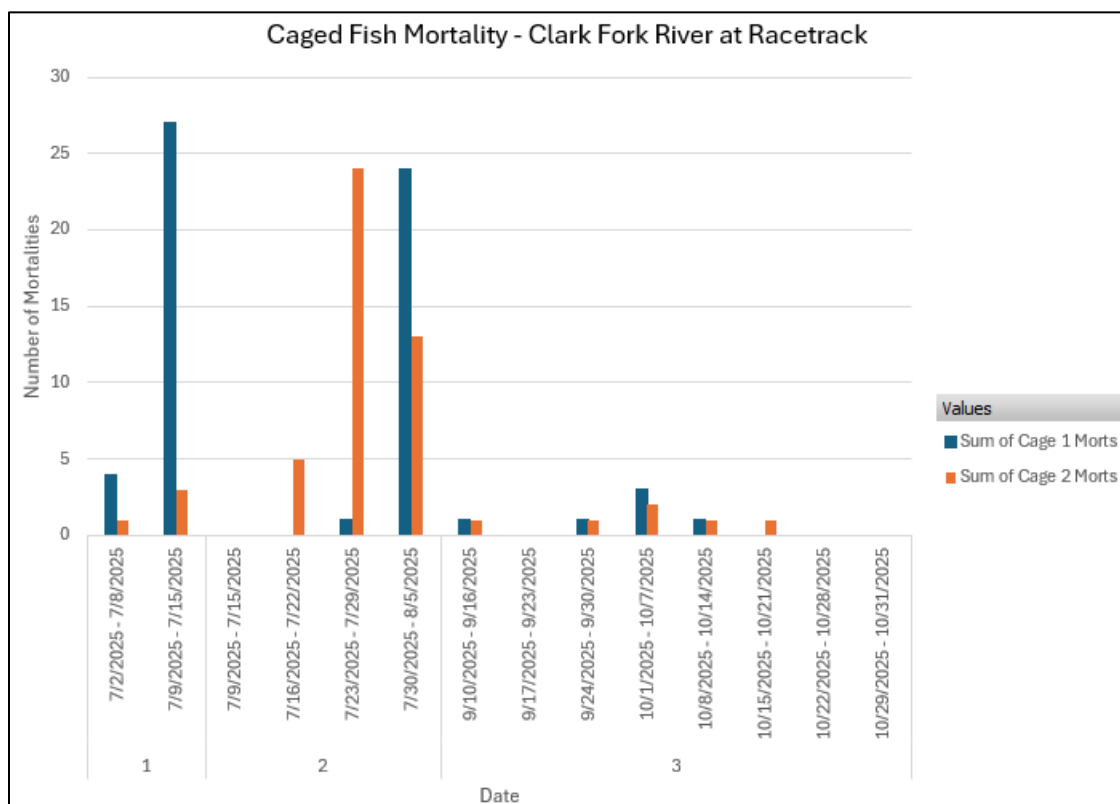


Figure 23. Weekly mortality rates in test cages at the Clark Fork River at Racetrack site.

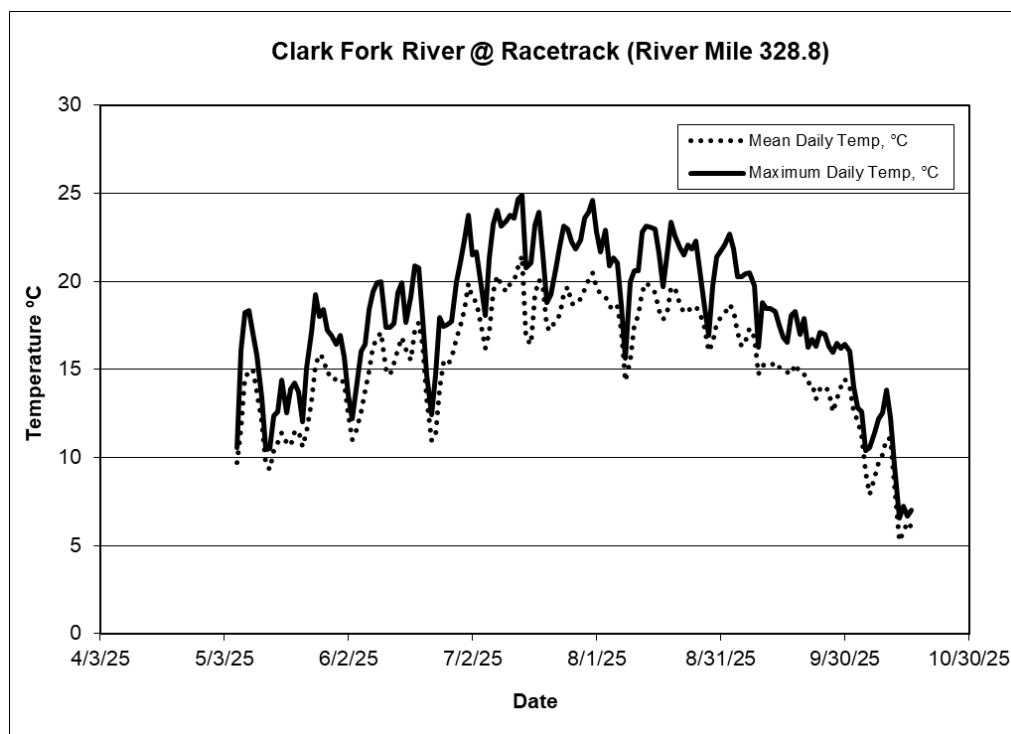


Figure 24. Mean and maximum daily temperatures recorded near the Clark Fork River at Racetrack cage location from May to October of 2025.

Discussion

Caged fish deployed in 2025 were deployed as part of a pilot study to determine methods to be used in graduate study in 2026. Specifically, we wanted to see if removing the cages from the river itself and placing them on the bank could reduce cage effect mortality and reduce issues associated with placing cages in the river. The cages we piloted can circulate more water than in-river cages in some conditions, particularly at low flow. We hypothesized the higher flow rate would reduce cage effect. We saw little to no cage effect at two of our sites but a high degree of cage effect at our most downstream site. The most downstream site is subject to the highest water temperatures of the three sites. Cage effect mortality may be prominent in any cage design when flows are low, and temperatures begin to exceed critical thresholds for brown trout. We observed very low mortality in the fall and winter, suggesting that holding fish in this style of cage has little to no direct mortality associated with the cage.

We learned other lessons from this pilot that will be applicable to any future studies utilizing this style of cage. We optimized a battery rotation schedule and solar panel set-up that can work to keep cages operational in the winter months. The 2025/2026 winter was very mild, and this approach would need close monitoring during a colder winter to ensure no further adjustments are needed. To avoid pump failure pumps should be replaced or maintained every 45-60 days during consistent operation. We observed fish in some cages utilizing the commercial feed faster than others. Future studies should regularly weigh fish and document excess food from standard measured feedings to account for any mortality or condition factor changes associated with feeding. This pilot shows the piloted cage method would work for a caged fish study and may have less cage effect relative to in-river cages made of screen, especially during cooler months.

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