

Attachment B

Supplemental Information

The following summaries provide additional supporting details to the following observations for the affected river system as compared to pre-2013, as stated in the Draft EA:

- A slower rate of hybrid trout expansion from downstream sources (Table 1).
- A reduced number of spawning adults in hybrid source streams (Figures 1 and 2).
- More westslope cutthroat trout captured at targeted hybrid source streams (Figure 3).
- An increase in the proportion of westslope cutthroat trout genetic composition in targeted hybrid source streams (Table 2).
- 53% fewer hybrids and rainbow trout spawning in upstream tributaries targeted for suppression – with more fish spawning in the mainstem Flathead River (Figure 4).
- A 19% average increase in angler catch rates for westslope cutthroat trout during 2015 and 2016 as compared to 2002 and 2003 (Tables 4 and 5).
- A more than 100% increase in the proportion of anglers specifically targeting westslope cutthroat trout upstream of the Stillwater River confluence during 2015 and 2016 as compared to 2002-2003 (Tables 6 and 7).

Rate of Hybrid Trout Expansion

The rate at which conservation populations of westslope cutthroat trout have become more than 10% genetically altered has slowed since manual removal of hybrids and rainbow trout began (Al-Chokhachy et al. 2014). “Conservation” populations, as defined by the Memorandum of Understanding and Conservation Agreement for Cutthroat Trout in Montana (FWP 2007) are greater than 90% genetically unaltered westslope cutthroat trout. Based on available data, at least 15 stream-dwelling conservation populations became 10% or more hybridized with rainbow trout prior to 2013 as compared to a net of 6 populations since 2013 (Table 1). Further, all fish-sustaining streams targeted for rainbow and hybrid trout removal showed a statistically significant ($p < 0.0001$, $\alpha = 0.01$) increase in the proportion of westslope cutthroat trout genetic material since about 2013 (Table 2).

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Table 1.—Tributaries in the affected Flathead River system in which westslope cutthroat trout became more than 10% genetically altered through hybridization with rainbow trout before and after 2013. Note that Rubideau Creek lost its conservation population status prior to 2013 but regained it thereafter, reducing the net number of tributaries lost since 2013.

| Drainage | Tributary | |
|-------------|-------------------------|-----------------------|
| | Pre-2013 | Post-2013 |
| North Fork | Anaconda Creek | Big Creek - middle |
| | Big Creek - lower | Coal Creek - lower |
| | Camas Creek | McGee Creek |
| | Cyclone Creek | Meadow Creek - lower |
| | Dutch Creek | SF Coal Creek -middle |
| | Langford Creek | Teepee Creek - lower |
| | Lookout Creek | |
| | Third Creek | |
| | | |
| Middle Fork | Abbot Creek | Pinchot Creek |
| | Ivy Creek | |
| | Harrison Creek | |
| | Lincoln Creek - lower | |
| | Moccasin Creek | |
| | Rabe Creek | |
| | Rubideau Creek - lower* | |

*This population became less than 10% genetically altered through hybridization with rainbow trout since 2013, restoring its conservation population status.

Table 2.—Changes in the proportion of westslope cutthroat trout (WCT) genetic material observed over time in tributaries targeted for rainbow and hybrid trout removal in the affected Flathead River system. All sites demonstrated a statistically significant ($p < 0.0001$, $\alpha = 0.01$) increase in the proportion of cutthroat alleles (versions of genes) over time.

| Drainage | Tributary | Percent WCT | |
|-------------|--------------------|-------------|-----------|
| | | Pre-2013 | Post-2013 |
| North Fork | Third Creek | 8* | 47 |
| Middle Fork | Abbot Creek | <1 | 27 |
| | Ivy Creek - lower | 51 | 79 |
| | Rabe Creek - lower | 44 | 58 |

*Samples collected in 2015.

Spawning Rainbow and Hybrid Trout in Targeted Tributaries

The rate at which spawning hybrid and rainbow trout have been captured by trapping and electrofishing target stream mouths over time has declined, controlling for effort (Figures 1 and 2). Further, the rate at which westslope cutthroat trout have been encountered during these removal efforts over time has increased (Figure 3).

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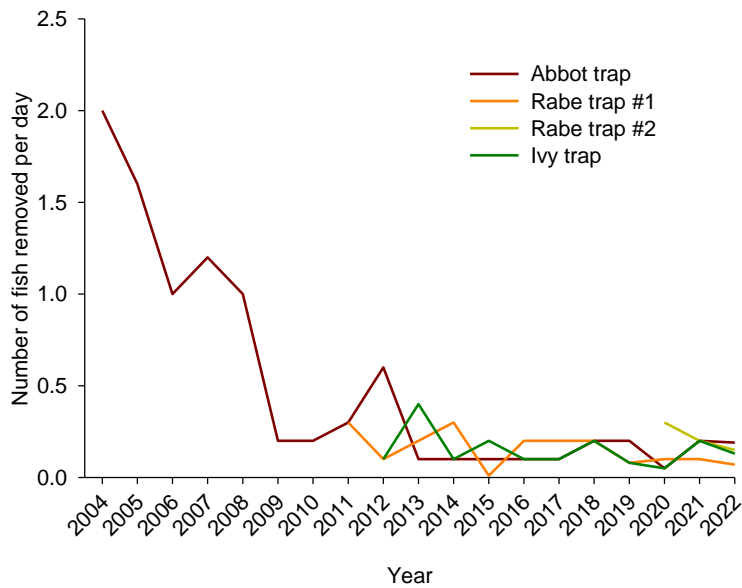


Figure 1.—Catch per unit effort (CPUE) for rainbow and hybrid trout removed during 2000-2022 from seasonal (spring) fish traps installed in Abbot, Ivy, and Rabe Creeks.

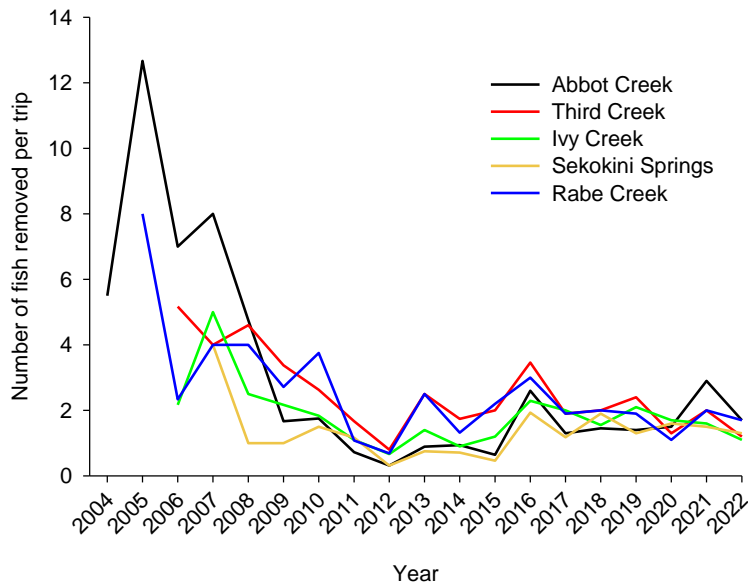


Figure 2.—Catch per unit effort (CPUE) for rainbow and hybrid trout removed during 2000-2022 from the mouths of five tributaries in the Flathead River system by boat electrofishing.

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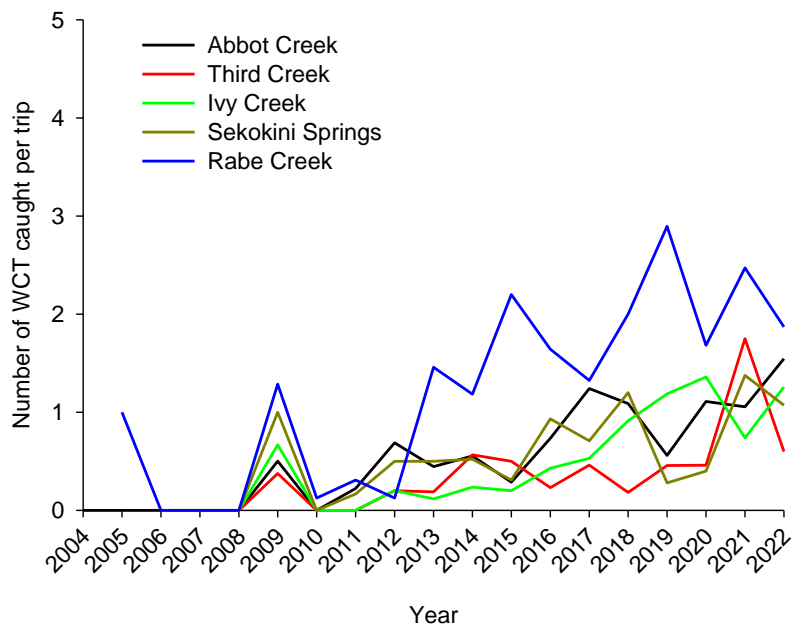


Figure 3.—Catch per unit effort (CPUE) for westslope cutthroat trout (WCT) encountered when removing rainbow and hybrid trout during 2009-2022 from the mouths of five tributaries in the Flathead River system by boat electrofishing.

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Table 3.—Numbers of rainbow and hybrid trout removed from tributaries in the Flathead River system by electrofishing and trapping from 2000 to 2022 (EF = electrofishing the tributary mouth by boat). Values in parentheses indicate the number of fish captured for each day spent electrofishing or trapping (i.e., catch per unit effort).

| Year | Abbot | | Ivy | | Sekokini | | Rabe | | | Third | Total removed |
|-------|----------|----------|---------|---------|----------|---------|-------------------|-------------------|---------|---------|---------------|
| | Trap | EF | Trap | EF | Trap | EF | Trap ¹ | Trap ² | EF | EF | |
| 2000 | 77(1.2) | | | | | | | | | | 77 |
| 2001 | 140(2.1) | | | | | | | | | | 140 |
| 2002 | 74(1.4) | 114 | | | | | | | | | 188 |
| 2003 | 12(0.2) | 43 | | | | | | | | | 55 |
| 2004 | 158(2.0) | 11(5.5) | | | | | | | | | 169 |
| 2005 | 131(1.6) | 76(12.7) | | | | | | | 8(8.0) | | 215 |
| 2006 | 77(1.0) | 21(7.0) | | 13(2.2) | | | | | 14(2.3) | 31(5.2) | 156 |
| 2007 | 95(1.2) | 8(8.0) | | 5(5.0) | | 4(4.0) | | | 4(4.0) | 4(4.0) | 120 |
| 2008 | 45(1.0) | 19(4.8) | | 10(2.5) | | 1(1.0) | | | 16(4.0) | 23(4.6) | 114 |
| 2009 | 16(0.2) | 10(1.7) | | 13(2.2) | | 1(1.0) | | | 19(2.7) | 27(3.4) | 86 |
| 2010 | 15(0.2) | 7(1.8) | | 11(1.8) | | 3(1.5) | | | 30(3.8) | 21(2.6) | 87 |
| 2011 | 20(0.3) | 13(0.7) | | 22(1.1) | | 14(1.2) | 21(0.3) | | 14(1.1) | 20(1.7) | 124 |
| 2012 | 44(0.6) | 5(0.3) | 7(0.1) | 10(0.7) | 0(0) | 5(0.3) | 8(0.1) | | 11(0.7) | 12(0.8) | 102 |
| 2013 | 8(0.1) | 16(0.9) | 32(0.4) | 24(1.4) | -- | 12(0.8) | 20(0.2) | | 36(2.0) | 40(2.5) | 188 |
| 2014 | 16(0.1) | 17(0.9) | 11(0.1) | 19(0.9) | -- | 15(0.7) | 23(0.3) | | 29(1.3) | 40(1.7) | 170 |
| 2015 | 10(0.1) | 9(0.6) | 20(0.2) | 18(1.2) | -- | 6(0.5) | 1(<0.1) | | 33(2.2) | 28(2.0) | 125 |
| 2016 | 10(0.1) | 39(2.6) | 5(0.1) | 32(2.3) | -- | 29(1.9) | 15(0.2) | | 42(3.0) | 45(3.5) | 217 |
| 2017 | 10(0.1) | 22(1.3) | 2(0.1) | 34(2.0) | -- | 20(1.2) | 17(0.2) | | 33(1.9) | 33(1.9) | 171 |
| 2018 | 21(0.2) | 16(1.5) | 16(0.2) | 17(1.6) | -- | 19(2.0) | 15(0.2) | | 22(2.0) | 22(2.0) | 148 |
| 2019 | 16(0.2) | 15(1.4) | 4(<0.1) | 23(2.1) | -- | 14(1.3) | 2(<0.1) | | 21(1.9) | 21(1.9) | 116 |
| 2020 | 4(<0.1) | 23(1.5) | 1(<0.1) | 25(1.7) | -- | 24(1.6) | 2(<0.1) | 6(0.3) | 17(1.1) | 17(1.3) | 119 |
| 2021 | 16(0.2) | 22(2.8) | 14(0.2) | 13(1.6) | -- | 12(1.5) | 3(<0.1) | 8(0.2) | 17(2.1) | 16(2.0) | 121 |
| 2022 | 20(0.2) | 22(2) | 10(0.1) | 14(1.1) | -- | 17(1.3) | 5(<0.1) | 10(0.2) | 20(1.5) | 16(1.2) | 134 |
| Total | 1035 | 529 | 122 | 303 | 0 | 196 | 132 | 24 | 385 | 416 | 3142 |

Changes in Hybrid and Rainbow Trout Spawning Behavior

Radio telemetry demonstrated that 65% of tagged hybrids and rainbow trout likely spawned in the Mainstem, North, Middle, or South forks of the Flathead River and side channels during 2016-2018 as compared to about 12% during 2000-2007 when most spawning occurred in tributaries containing westslope cutthroat trout (Figure 4), suggesting that there may be a shift in the proportional use of spawning habitat by hybrids and rainbow trout. Although non-hybridized westslope cutthroat trout continue to be threatened by spreading rainbow trout introgression, these results suggest that focused suppression of hybridization sources can be a beneficial strategy for maintaining conservation populations of westslope cutthroat in a large, interconnected river drainage.

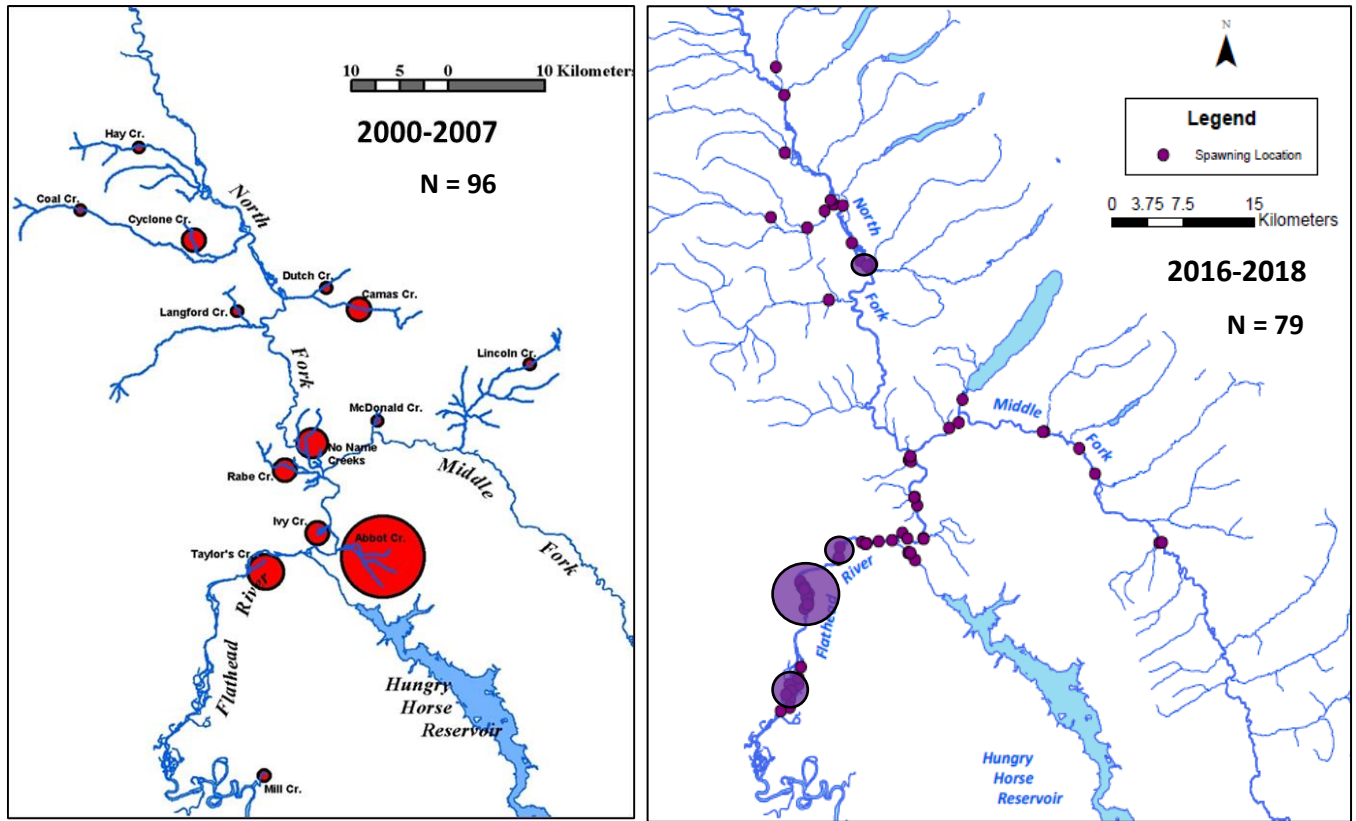


Figure 4.—Spawning locations of hybrid and rainbow trout during 2000-2007 (left) (Muhlfeld et al. 2009) and 2016-2018 (right) (Steed et al. 2020) in the upper Flathead River system. The size of each dot is proportionate to the number of fish presumed to have spawned in each location.

Angling Information

Angler surveys conducted in portions of the affected river system during 2002-2003 and 2015-2016 revealed changes in angler catch rates and preferences over time (Deleray 2004; Steed and Hunt 2020). Specifically, a 19% average increase in angler catch rates for westslope cutthroat trout was observed during 2015 and 2016 as compared to 2002 and 2003 (Tables 4 and 5). Further, more than twice the average proportion of anglers explicitly targeted westslope cutthroat trout upstream of the Stillwater River confluence during 2015 and 2016 than they did during 2002-2003 (Tables 6 and 7). These anglers outnumbered those targeting rainbow trout by 2-18% during 2002-2003 and by 22-47% during 2015-2016. In other words, over time anglers are catching more westslope cutthroat trout and more of those anglers prefer to target the species over any other trout.

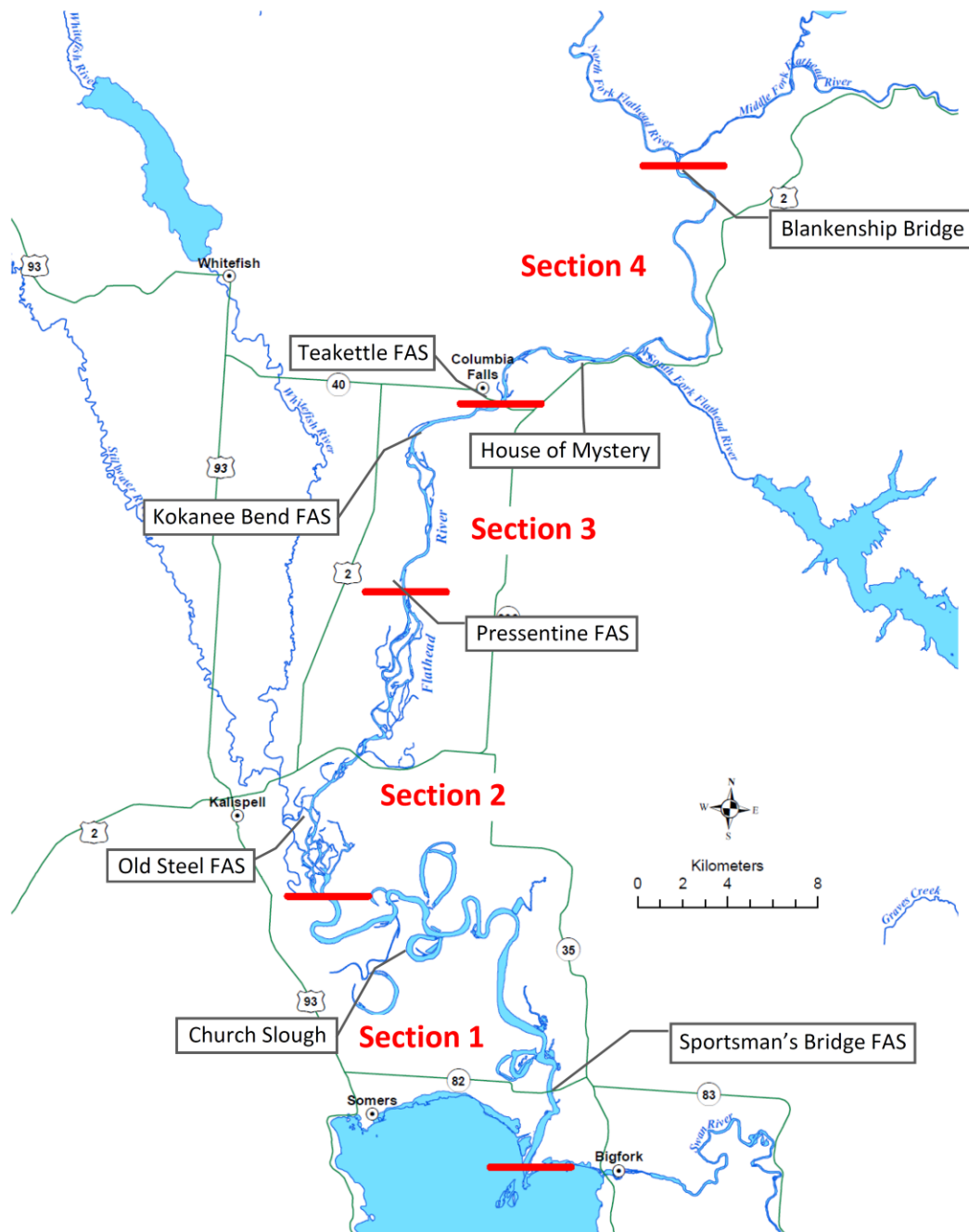


Figure 5.—Study area of the Flathead River system targeted by two separate creel (angler) surveys conducted from June 2002 through May 2003 and March 2015 through February 2016, respectively. An additional Section 5 included the lower Flathead River sloughs, as in Deleray (2004). Angler access points used by creek clerks during 2015–2016 are shown by name and location, where FAS = Fishing Access Site. From Steed and Hunt (2020).

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Table 4.—Angler harvest rates (fish per hour), harvest, and catch rates (fish per hour) for all sections combined, Flathead River and associated sloughs 2002-2003. From Deleray (2004).

| Species | Harvest Rate | Variance | Number Harvested | Variance | Catch Rate | Variance |
|--------------------|--------------|----------|------------------|----------|------------|----------|
| Lake Trout | 0.05 | 3.54E-05 | 1,246 | 8.41E+04 | 0.07 | 5.37E-05 |
| Lake Whitefish | 0.70 | 1.43E-03 | 21,824 | 1.11E+07 | 0.79 | 7.02E-03 |
| Yellow Perch | 0.02 | 2.36E-05 | 484 | 5.74E+04 | 0.03 | 4.61E-05 |
| W. Cutthroat Trout | 0.00 | 0.00E+00 | 0 | 0.00E+00 | 0.16 | 1.10E-04 |
| Rainbow Trout | 0.003 | 2.18E-06 | 167 | 1.64E+04 | 0.03 | 1.08E-05 |
| Bull Trout | 0.00 | 0.00E+00 | 0 | 0.00E+00 | 0.02 | 1.01E-05 |
| Pike | 0.01 | 2.39E-06 | 575 | 9.35E+03 | 0.02 | 5.84E-06 |
| Largemouth Bass | 0.0001 | 6.97E-09 | 10 | 1.16E+02 | 0.02 | 1.82E-05 |
| Mountain Whitefish | 0.00 | 0.00E+00 | 0 | 0.00E+00 | 0.07 | 4.61E-05 |
| Other | 0.04 | 1.06E-04 | 904 | 1.75E+05 | 0.06 | 1.39E-04 |
| Total | 0.82 | 1.60E-03 | 25,209 | 1.28E+07 | 1.25 | 7.47E-03 |

Table 5.—Mean angler harvest rates (fish harvested per hour), harvest, and catch rates (fish caught per hour) for all river sections combined in the Flathead River during 2015-2016. From Steed and Hunt (2020).

| Species | Harvest rate | Variance | Number harvested | Variance | Catch rate | Variance |
|--------------------|--------------|----------|------------------|----------|------------|----------|
| Lake Trout | 0.0027 | 1.15E-06 | 123 | 1.11E+04 | 0.01 | 7.70E-06 |
| Lake Whitefish | 0.0581 | 3.46E-05 | 1,819 | 1.31E+05 | 0.07 | 4.29E-05 |
| Yellow Perch | 0.0050 | 2.36E-06 | 427 | 2.54E+04 | 0.30 | 5.30E-04 |
| W. Cutthroat Trout | 0.0007 | 1.13E-07 | 63* | 1.02E+03 | 0.19 | 4.75E-05 |
| Rainbow Trout | 0.0004 | 2.13E-08 | 37 | 2.87E+02 | 0.03 | 2.63E-06 |
| Bull Trout | 0.0000 | 0.0000 | 0 | 0.00E+00 | 0.01 | 2.31E-06 |
| Northern Pike | 0.0098 | 1.32E-06 | 1,071 | 2.50E+04 | 0.04 | 7.02E-06 |
| Largemouth Bass | 0.0007 | 4.39E-08 | 83 | 1.06E+03 | 0.03 | 6.12E-06 |
| Mountain Whitefish | 0.0041 | 1.10E-06 | 166 | 3.34E+03 | 0.02 | 5.57E-06 |
| Other | 0.0111 | 5.74E-06 | 1,242 | 1.67E+05 | 0.04 | 3.04E-05 |
| Total | 0.0929 | 4.99E-05 | 5,031 | 3.65E+05 | 0.73 | 6.82E-04 |

*Although Westslope Cutthroat Trout could be legally harvested from Section 5 (sloughs) during the creel period, harvest was only observed in Section 2. Thus, these fish were either misidentified, harvested from a slough, or illegally harvested.

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Table 6.—Targeted fish species identified through angler interviews for the five Flathead River sections, 2002-2003. Values are percentages of angler interviews in each section. From Deleray (2004).

| | WCT | RBT | No Target | LWF | LT | Pike | Bass | Perch | MWF | Non-Game |
|-----------|------|-----|-----------|------|------|------|------|-------|-----|----------|
| Section 4 | 25.0 | 9.0 | 65.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 |
| Section 3 | 24.3 | 6.2 | 34.6 | 34.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Section 2 | 3.3 | 1.7 | 20.7 | 72.5 | 0.7 | 0.1 | 0.0 | 0.1 | 0.6 | 0.4 |
| Section 1 | 1.1 | 0.4 | 59.3 | 0.7 | 15.4 | 19.6 | 2.1 | 0.0 | 0.0 | 1.4 |
| Sloughs | 0.0 | 0.0 | 16.7 | 0.0 | 2.1 | 70.0 | 7.4 | 3.8 | 0.0 | 0.0 |

Table 7.— Percentages of anglers who reported targeting specific species during 2015-2016 in the Flathead River system, by river section. WCT = westslope cutthroat trout, RBT = rainbow trout, LT = lake trout, LWF = lake whitefish, NP = northern pike, YP = yellow perch, Other = non-game and bait species (e.g., longnose sucker, northern pikeminnow, peamouth chub), NT = no specific target species, CR = black crappie, LB = largemouth bass, and MWF = mountain whitefish. River sections are listed from upstream down and are defined in Figure 5.

| Section | WCT | RBT | LWF | NP | LT | YP | Other | No Target | CR | LB | MWF |
|----------------|-----|-----|-----|-----|-----|----|-------|-----------|----|-----|-----|
| 4 | 34% | 8% | 3% | 0% | 1% | 0% | 0% | 53% | 0% | 0% | 1% |
| 3 | 50% | 3% | 5% | 0% | 0% | 0% | 0% | 39% | 0% | 0% | 1% |
| 2 | 27% | 5% | 36% | 1% | 4% | 0% | 0% | 26% | 0% | 0% | 0% |
| 1 | 1% | 2% | 3% | 9% | 10% | 1% | 0% | 63% | 1% | 10% | 1% |
| 5 | 0% | 0% | 0% | 47% | 0% | 7% | 0% | 17% | 6% | 22% | 0% |
| Weighted mean* | 24% | 4% | 10% | 13% | 2% | 2% | 0% | 36% | 2% | 6% | 1% |

*Using the weighted mean accounts for the differing number of anglers interviewed over time and across river sections, avoiding bias in estimated percentages.