

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2020 ANNUAL REPORT

PROJECT: FR-115

Project Title:

Monitoring effects of Flaming Gorge Dam releases on the Lodore and Whirlpool Canyon fish communities

Bureau of Reclamation Agreement Number:

R19AP00058

Project/Grant Period:

Start date: 10/01/18

End date: 09/30/23

Reporting period end date: 09/30/2020

Is this the final report? ___ No ___

Principal Investigator:

Kevin R. Bestgen, E. Kluender, and K. Zelasko
Larval Fish Laboratory
Dept. of Fish, Wildlife, and Conservation Biology
Colorado State University
Ft Collins, Colorado 80523
970-491-1848/ fax 970-491-5091
kbestgen@colostate.edu

Christian Smith
Vernal Colorado River Fish Project
U.S Fish and Wildlife Service
1380 S. 2350 W.
Vernal, Utah 84078
435-789-0354/ fax 435-789-4805
christian_t_smith@fws.gov

Abstract:

The primary purpose of this study is to determine the cumulative effect that flow and temperature regimes downstream of Flaming Gorge Dam have had on the fish community of the Green River in Lodore and Whirlpool canyons and to recommend how to monitor effects into the future. A secondary purpose is to determine the distribution and abundance of the humpback chub population in Whirlpool Canyon to serve as the basis for future monitoring efforts. Finally, a third purpose is to remove nonnative fishes present in the study reach. Future sampling is needed to monitor response of the fish community to removal of smallmouth bass, particularly in the Whirlpool Canyon reach of the Green River; data will also be useful to monitor changes in chub abundance, should that population expand. A portion of nonnative fish removal work is devoted to better understanding the reproductive ecology of smallmouth bass in the Green River study area. The collection of young-of-year smallmouth bass, and analysis of otolith microstructure, will allow determination of hatching dates of bass relative to

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

streamflow and water temperature patterns. This information may be useful to understand if flow releases from Flaming Gorge Dam may be useful to disadvantage smallmouth bass in the study area. Northern pike are also a species targeted in removal efforts and occur mainly in upstream Browns Park. Information gathered will be used to evaluate the relative benefit of flow and temperature regimes from Flaming Gorge Dam to native and endangered fishes in the Green River compared to effects on distribution and abundance of non-native fishes.

Study Schedule:

Initial Year 2002, final year undetermined

Relationship to RIPRAP:

Green River Action Plan: Mainstem.

II.D. Evaluate and revise as needed, flow regimes to benefit endangered fish populations.

Accomplishment of FY 2020 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Thermographs

We assisted with temperature data collection in Lodore and Whirlpool canyons by removing thermographs from the Green River in July and September, resetting new ones in their place, and establishing/checking new locations in both lower Lodore Canyon near the long-term site, and in lower Mitten Park on river right in 2014; that monitoring continues through 2020. Over the past decade, the thermal regime of the Green River upstream of the Yampa River has varied. The section experienced a relatively warm regime from 2002-2007 (2005 was cool) when water temperatures routinely exceeded 20°C at the Gates of Lodore, and exceeded 25°C in 2002-2003 and 2006-2007. Cooler thermal regimes prevailed for much of the 2008-2011 period, when water temperatures exceeded 20°C for just a few days each summer (Figure 1). Water temperatures were warmer in 2012 and 2013 but cooler in 2014-2017, when mean daily water temperature only occasionally or did not exceed 20°C at the Gates of Lodore (gauge 404417108524900). Water temperatures increased slightly since 2018, likely due to low flows in summer. Last year we reported that neither mean nor daily maximum water temperature at that gage exceeded 20°C during 2019 at the Lodore temperature gage site, a first since temperature recording began at this location in 2003. Those data must have been revised by the USGS and the gage recalibrated because water temperatures in 2019 now show data above the 20°C level.

To document effects of high spring flow releases on water temperatures, we plotted those data for the last several years to look for trends (see past annual reports for this project for 2016-2019). In general, Green River water temperatures at the Gates of Lodore were increasing in May consistent with warming air temperatures to maxima near 20°C, but during high flow releases (up to 9100 cfs) typically beginning in late May until the end of June, water temperatures declined to less than 12°C (Figure 1 B for 2020). Comparison of water temperatures from releases at Flaming Gorge Dam to the Gates of Lodore (e.g., Figures 1 C and 1 B) showed little warming downstream in those high flow periods, in part because travel rates of water are short during high discharge events. Water temperature recovered

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

slightly downstream but only after high flows ceased. Highest water temperatures in 2017 were in late-July but daytime maxima exceeded 20°C for only a couple days. Water temperatures in 2018 and 2019 more closely approximated those in 2016, with reduced temperatures during spring releases; water temperatures warmed to or above 20°C in daytime for portions of the summer in 2018, and cool summer 2019 water temperatures were noted above. In 2020, summer water temperatures were relatively warm, with daytime highs exceeding 20°C on most days between late June and early September.

Water temperature differences between the cooler Green River and the warmer Yampa River were large in 2017 (Figure 2), particularly after the first Colorado pikeminnow larva was observed on 1 July. For example, in the period when Colorado pikeminnow larvae were present (1 July to 9 August), the Green River was $\geq 5^{\circ}\text{C}$ cooler than the Yampa River on 22 days. Mean water temperature difference in that period was 5.7°C, with a maximum of 9.0°C. In 2018, in the period when Colorado pikeminnow larvae were present (20 June to 3 August), the Green River was cooler than the Yampa River by 5°C or more on 17 days. Mean water temperature difference in that period was 4.6°C, with a maximum of 5.7°C. In 2019, in the period when Colorado pikeminnow larvae were present (12 July to about 15 August), the Green River was cooler than the Yampa River by 5°C or more on 0 days. Mean water temperature difference in that period was 2.9°C cooler, with a maximum difference of 4.5°C. In 2020, in the period when Colorado pikeminnow larvae were present (28 June to about 5 August, end date estimated), the Green River was cooler than the Yampa River by 5°C or more on 2 days (July 20 and 21). Mean water temperature difference in that period was 3.6°C cooler, with a maximum of 5.6°C cooler.

Task 2: Sample main channel fish community (large-bodied fishes).

Lodore-Whirlpool electrofishing

We completed two electrofishing trips through the study area in 2020, as prescribed in the scope of work. We reported on data collected through 2006 in a summary report. Electrofishing data entry and verification is complete for 2007-2020 and 2019 seine sample analysis is nearly complete. We are in the process of summarizing data for an updated synthesis report, which will include electrofishing data through 2020 and seine sampling data through 2018.

A total of 11 native species, 20 nonnative species, and several hybrids have been collected in the study area by all sampling gears in the period 2002-2020 (Tables 1 and 2, Figures 3 and 4). The most species are captured by electrofishing, followed by seining, and trammel netting. In 2020, the most abundant nonnative species in the Lodore Canyon study area captured by electrofishing was, by a large margin, brown trout, reflecting high and increasing abundance trend for that species (Table 2, Figure 3). Native flannelmouth sucker and bluehead sucker is declining in this reach rather dramatically, as well as in Whirlpool Canyon, while one native, cool water tolerant mountain whitefish, is increasing. Native fishes were only 19.8% of the entire Lodore Canyon fish community (35% in 2018 and 2019, 52% in 2017, 54% in 2016, 61% in 2015), continuing a declining trend. Bluehead and flannelmouth sucker declines are consistent and long-term, a trend that should be tracked in this and other populations. Mountain whitefish were more abundant than bluehead sucker in Lodore Canyon in 2017-2020, which is not typical. Brown trout, white sucker, and common carp, in descending order, were the most abundant nonnative fishes captured in the Lodore Canyon study area, with brown trout exceeding total native

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

sucker in abundance in 2020. Smallmouth bass abundance in Lodore Canyon has also declined dramatically in recent years.

Native species were more abundant in downstream Whirlpool Canyon, where 60% (67% in 2019, 51% in 2018, 63% in 2017, 70% in 2016, 71% in 2015) of all fishes collected by electrofishing were native in 2020, substantially higher than in upstream Lodore Canyon. A main difference was higher abundance of bluehead sucker and lower abundance of brown trout, white sucker, and common carp in Whirlpool Canyon. Among nonnative fishes, coolwater brown trout were more abundant in upstream Lodore Canyon and warmwater smallmouth bass and channel catfish were more abundant downstream in Whirlpool Canyon. White crappie is a relatively new species in the study area, collected with seines in Whirlpool Canyon in 2016, but overall, is rare.

Abundance patterns of fishes in the study area that were captured in electrofishing samples beginning in 1994-1996 reflected a dynamic community for both nonnative and native fishes (Figures 3 and 4). For example, nonnative brown trout was abundant through time in Lodore Canyon and apparently increased in 2012, declined in abundance in 2013-2017 to relatively lower levels, but increased abruptly in 2018-2020. Brown trout abundance increased slightly in Whirlpool Canyon in 2012-2014, declined in 2015 and 2016, but increased after that time, although abundance is low. Channel catfish reached a peak in abundance in both Lodore and Whirlpool canyons in the 2005-2008 period but have declined steadily since, the slight increase in 2016 in both Lodore and Whirlpool Canyon reaches notwithstanding. Note the 1994-1996 abundance as the lowest in the period of record in Lodore Canyon. Common carp abundance appears to be declining in both reaches over time, especially in Whirlpool Canyon, even though 2015-2016 and 2018-2019 abundance increased slightly in Lodore Canyon. Northern pike abundance is low overall but generally highest in Lodore Canyon. The spike in 2016 abundance in Lodore Canyon was from only five individuals, but abundance further increased in 2017 to the second highest level ever (first was 2005-2007), dropped slightly in 2018 and 2019 ($n = 2$), but was higher in 2020 ($n = 13$). Northern pike abundance in Whirlpool Canyon is low, likely a byproduct of high removal in the upstream Yampa River which reduces movement into downstream reaches. This includes 2020, where no pike were captured but reduced effort was applied upstream. Browns Park pike removal efforts in 2011-2020 are discussed more extensively below.

Smallmouth bass abundance trends in Lodore and Whirlpool canyons showed slightly different patterns over time. In Whirlpool Canyon, bass abundance peaked in 2005-2007, and 2013, declined through 2017, but increased slightly since that time, including in 2020. That 2013 increase may be the result of warm water temperatures in 2012, leading to successful spawning that produced many age-1 fish in 2013. While earlier declines may reflect substantially increased removal effort beginning in 2007 and lack of high recruitment through 2011, bass respond positively to warmer temperatures in some years. Declining abundance of Whirlpool Canyon bass may be due to continued and intensive removal there. Smallmouth bass abundance in Lodore Canyon peaked in 2009 and 2010, declined through 2012, increased slightly in 2013 as for Whirlpool Canyon, and then continued lower through 2020, when few smallmouth bass were captured in the reach ($n = 4$ in 2020). White sucker abundance increased in Lodore Canyon through 2009 but then declined through 2015, with a slight increase in 2016-2020. With the exception of 2009 and 2018, white suckers in Whirlpool Canyon were relatively uncommon through 2020.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Native bluehead sucker are uncommon in Lodore Canyon, and were declining in Whirlpool Canyon, but in 2018 and 2019 (but not 2020) recovered somewhat to levels that approach those recorded in 2013-2014. Colorado pikeminnow abundance has been variable but declining and relatively low over the study period, increased in 2010 and 2012 in each reach, low overall in 2015, increased in 2016 (n = 6 fish), but few have been captured since 2017 in either reach. Abundance of pikeminnow in upstream Vermillion Creek in 2011-2020 is discussed below. Flannelmouth sucker, the most common large-bodied native fish in the study area, has been declining over time in Lodore Canyon and especially Whirlpool Canyon, even though its abundance increased in 2015 and 2016 in each reach to about average levels. Flannelmouth sucker was most abundant in 2006 in Whirlpool Canyon. Mountain whitefish abundance increased rather dramatically in the study area in some years such as 2009-2010, 2012, and 2016-2020 but were uncommon before 2007 and from 2013-2015. Increased salmonid abundances in both reaches may be a response to cooler water temperatures.

Abundance of all chub species in electrofishing samples declined rather dramatically, especially since 2002-2004, patterns also reflected by trammel net sampling. Capture of a few chubs in 2013 electrofishing in Lodore Canyon increased abundance there temporarily, but 2014 abundance was reduced in both reaches, none were captured in either Lodore or Whirlpool Canyon reaches in 2015, 2017 or 2020, and only one was captured in each of 2016, 2018, and 2019, all in Whirlpool Canyon.

In 2020, we did not conduct a dedicated trammel net sampling trip because of timing and personnel issues and pandemic issues affected our ability to conduct work in October. Instead, we sampled with trammel and hoop nets during our late September electrofishing sampling trip at previously productive locations in Lodore and Whirlpool canyons. The 38 trammel net hrs (one 75-ft long net fished for one hour is 1 net hr) sampled eddies and pools and captured channel catfish (n = 20), flannelmouth sucker (14), bluehead sucker (5), white sucker (12), Colorado pikeminnow (2), flannelmouth sucker x white sucker hybrid (2), and roundtail chub and smallmouth bass (1 each). Both Colorado pikeminnow were sampled in lower Lodore Canyon (Lake Limestone; 745 mm TL and 587 mm TL). One roundtail chub was captured in Lower Lodore Canyon (Lake Limestone; 450 mm TL); this fish was not previously tagged. The hoop nets were deployed in both lower Lodore and Whirlpool canyons simultaneously with trammel nets. Two hoop nets were used at each location, and the combined 53 net hours yielded no adult fish. However, one hoop net captured two young-of-year smallmouth bass in lower Lodore Canyon. Water was clear and relatively high, although net locations were identical to those used in the past so higher captures of all species were expected.

Browns Park fish community sampling and northern pike removal

Beginning in 2005, northern pike were detected every year in Browns Park, with the exception of 2007 (Figure 5). Initially, only smaller pike were captured in seine samples taken in backwaters in July and September at Swinging Bridge near the Colorado-Utah state line. Their continued presence motivated additional floodplain sampling in an attempt to remove as many adult pike as possible. Thus, beginning in 2011 and continuing through 2020, we expended sampling effort for removal of northern pike in the Browns Park reach of the Green River. During the high flow year 2011 in May and June many large pike, some exceeding 900 mm TL (n = 22, 11-39 inches, 271-984 mm) were captured and removed; all were from a relatively restricted river reach about 1-mile long. During that sampling, two adult Colorado pikeminnow were captured, one by angling and another in a trap net. This was unusual because pikeminnow are thought rare in the 56-mile long reach between Flaming Gorge Dam and the

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

upstream end of Lodore Canyon which includes the Swinging Bridge area. In 2012, we captured additional northern pike in the Browns Park reach during a relatively brief period of high flows. Interestingly, only three young-of-year were captured in summer and autumn, which was perhaps a function of the brief period of floodplain inundation. No young of year northern pike were captured in 2013 in Browns Park, again likely a result of relatively short-term floodplain inundation. This is in spite of capture of ripe northern pike in late May and early June, indicating reproduction was likely occurring.

In 2014, continued backwater and floodplain habitat sampling occurred with trammel and fyke nets from 26 May to 20 June. Twelve adult northern pike were captured and ranged from 626-794 mm TL (1814-3657 g). Most were captured in Beaver Creek (n = 7), but northern pike were also captured at or near Hog Lake (n = 2) or in Vermillion Creek (n = 3). The Vermillion Creek pike were the first ones captured there since 2011 when sampling began. In spite of warm water temperatures earlier in the season, many pike were still in reproductive condition in late May to mid-June. Of the 10 fish whose sex was determined, six were females.

We captured a total of 13 age-0 northern pike in 13 July 2014 seine sampling in Browns Park at the mouth of Beaver Creek, ranging in size from 44 to 61 mm TL. An additional seven age-0 northern pike were captured in seine sampling on 14 September at Beaver Creek (n = 6) and Hog Lake (n=1), ranging in size from 174 to 218 mm TL.

Northern pike sampling and removal in 2015 began on 12 May and continued through 9 June. Due to extensive habitat availability and high initial fish catch, sampling was focused primarily in the State Line and Beaver Creek reach; all other accessible backwaters and tributaries in the Refuge were sampled opportunistically during this period, however. Nine adult northern pike (289 – 776 mm, 260 – 2800 g) were captured. As in 2014, most were captured in Beaver Creek (n = 4), but the State Line backwater (n = 2), a backwater near Spitzie Bottom (n = 2), and Vermillion Creek (n = 1) produced pike. All adult northern pike were male. In addition to trammel netting for adults, intensive nighttime light-trapping for age-0 pike was conducted for the entire sampling period. As with trammel netting, effort focused on the State Line backwater to Beaver Creek reach, but some efforts were made in other backwaters.

Light trapping in 2015 produced one age-0 northern pike (30 mm TL) in Beaver Creek on 23 May. A single age-0 northern pike was collected in seine sampling in Browns Park on 19 July. This individual was 126 mm TL and was captured near the boat ramp at Crook Campground.

Sampling in 2016 in Browns Park National Wildlife Refuge occurred between 11 May and 18 June. Sampling was carried out by a crew of two to six individuals. Trammel nets measuring 15 m x 2 m were the primary gear used for adult fish, with some supplementary angling. A total of 54 net sets were made, totaling 353.67 net hours. Two boat electrofishing passes were conducted; the first covered the left bank between river miles 380.3 (Swinging Bridge Boat Ramp) and 372.2 (Crook Campground Boat Ramp) and the second was conducted between river miles 372.2 and 366 and included the lower 400 meters of Vermillion Creek. Boat electrofishing effort totaled 3.4 hours. Five adult northern pike were captured by nets, and none were captured by boat electrofishing.

Light traps were deployed in backwaters at night to detect the presence of larval fish, northern pike being the primary target species. We focused light trap sampling efforts in the backwaters and main

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

channel shoreline between the state line and the Swinging Bridge boat ramp. Up to five light traps were deployed most nights, and effort totaled 743.97 trap hours. No pike were captured.

Sampling in 2017 in Browns Park National Wildlife Refuge occurred between 8 May and 15 June. Sampling was carried out by a crew of two to six individuals. Trammel nets were the primary gear used for adult fish, with some supplementary angling. A total of 49 net sets were made, totaling 381.43 net hours. Light traps were deployed in backwaters at night to detect the presence of larval fish, northern pike being the primary target species. We focused light trap sampling efforts in the backwaters and main channel shoreline between the state line and the Swinging Bridge boat ramp. Up to five light traps were deployed most nights, and effort totaled 953 trap hours.

During the 2017 study, 199 individual adult fish of all species were captured, down considerably from the 864 in 2016. Of these, 34 were native fishes, with most of the remainder being nonnative suckers (white sucker) or hybrids and salmonids, and all natives were released alive. Ten adult northern pike were captured. Light traps yielded a total of 3 fish; all preserved and identified in the laboratory as YOY northern pike..

Additionally, prolonged inundation of vegetated backwaters, tributaries, and channel margin habitat, locations suitable for reproduction of northern pike, likely contributed to more extensive reproduction of that species than has been documented in previous years. Seine sampling in the mouth of Beaver Creek and other Browns Park locations (Hog Lake, Crook Campground) on 16 July 2017 yielded the highest documented numbers of young-of-year northern pike (31 total) since young-of-year fish sampling in the Refuge began in 2002. Additional YOY northern pike were captured at Beaver Creek in September. The YOY fish varied widely in length and represent several spawning bouts over the extended high flow season. We plan to age those fish using otolith daily increments to understand better the duration of the spawning season.

In 2018, sampling was carried out by a crew of two to seven individuals. Trammel nets were the primary gear used for adult fish, with some seine sampling and supplementary angling. A total of 39 trammel net sets were made, totaling 247 net hours. Light traps were deployed in backwaters at night to detect the presence of larval fish, northern pike being the primary target species. We focused light trap sampling efforts in the backwaters and main channel shoreline between the state line and the Swinging Bridge boat ramp. Up to five light traps were deployed on most nights, and effort totaled 455 trap hours.

During 2018 sampling, 159 individual adult fish were captured by trammel nets. Of these, 17 were native species, hybrids of native species, salmonids, or unidentified, and all were released alive. The remaining 142 individuals were nonnative species, mostly white suckers or their hybrids, and were euthanized. Two large adult northern pike were captured (760 mm and 822 mm TL). Colorado pikeminnow were captured only in Vermillion Creek. Light traps yielded no young-of-year northern pike.

The hydrology in the Green River below Flaming Gorge Dam during May and June of 2018 was relatively low. Peak flow was the second lowest in the previous eight years of record, at 6,400 cubic feet per second (cfs), achieved on 29 May. Only 14 days of flows above 3,000 cfs were reached, making 2018 hydrology similar to that of 2012 and 2013, both notably low flow years (2013 with a peak of 5,450 cfs and 12 days above 3,000 cfs, and 2012 with a peak of 7,920 cfs and 12 days above 3,000 cfs).

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

The total fish capture for 2018 remained unusually low. We hypothesize this is a latent effect of the record high flows from Flaming Gorge in 2017, when there were 130 days of flow above 8,600 cfs and may have prompted dispersal of adult fish resident to the Browns Park reach of the Green River; electrofishing captures were also reduced in 2017 and 2018. It is also possible that those flows decreased the suitability of the habitat in the reach by another mechanism. We were also surprised by the low abundance of northern pike captured in samples in 2018, after finding age-0 pike in high numbers in 2017. It may be that those now age-1 pike were not yet susceptible to our capture techniques although some of those fish were captured in downstream reaches.

During 2019, sampling was conducted by a crew of two to five individuals. Trammel nets were the primary gear used for adult fish, with some seine sampling and supplementary angling. A total of 40 trammel net sets were made, totaling 258.3 net hours. Light traps were deployed in backwaters at night to detect the presence of larval fish, northern pike being the primary target species. We focused light trap sampling efforts in the backwaters and main channel shoreline between the state line and the Swinging Bridge boat ramp. Up to five light traps were deployed on most nights, and effort totaled 610.5 trap hours.

During the study, 429 individual adult fish were captured by trammel nets. Of these, 77 were native species, hybrids of native species, or salmonids, and were released alive. The remaining 352 individuals were nonnative species and were euthanized. Three adult northern pike were captured (588 mm, 644 mm, and 800 mm TL). Colorado pikeminnow were captured only in Vermillion Creek. Light traps yielded no young-of-year northern pike.

The total fish capture for 2019 is similar to years prior to 2017, during which spring peak flows from Flaming Gorge Dam were prolonged. Native fishes accounted for only 14.5% of the total catch in 2019, the second lowest proportion in the last five years of sampling. Of the nonnative fishes captured, white suckers and white sucker x flannelmouth sucker hybrids totaled 79% of the total catch. These trends indicate a recolonization of the reach by adult fishes, and by white suckers and their hybrids in particular.

During 2020, two separate crews of 3-4 people each carried out sampling simultaneously, due to COVID restrictions and the need to intensify sampling during a short period of peak flow discharge from Flaming Gorge Reservoir. Trammel nets and fyke nets were the primary gear used for adult fish, with some seine sampling and supplementary angling. A total of 24 trammel net sets were made, totaling 128.9 net hours. Fyke nets were set for several days and nights during the sampling period in Beaver Creek and State Line backwaters, totaling 152 net hours. Light traps were not deployed in 2020, with extra effort instead focused on evening and night sampling for adult fish.

During the 2020 study, 163 individual adult fish were captured by trammel nets. Of these, 34 were native fishes, hybrids of native species, or salmonids, and were released alive. The remaining 129 individuals were nonnative species and were euthanized.

The total fish capture for 2020 was lower in absolute numbers and catch per unit effort (CPUE) than previous years. Travel and work restrictions due to the COVID-19 pandemic complicated our operations and we were unable to begin most sampling prior to the onset of spring peak releases from

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Flaming Gorge Dam. This initial ascending limb of the spring releases concentrates many fish in the backwaters in which we focus our sampling efforts, and thus drives much of our fish capture in typical years. Because our sampling began after peak flow was reached, fewer fish than average were captured. Additionally, the short duration of peak flows likely contributed to these low numbers. Native fishes accounted for 19% of the total catch, an improvement over the previous three years when native fishes were only 9.4-17.1% of the total captured. Of the nonnative fishes captured, white suckers and white sucker x flannelmouth sucker hybrids totaled 74.3% of the total catch. This degree of dominance of the catch by these taxa is typical. Two adult northern pike were captured (590 mm and 612 mm TL).

Browns Park Colorado pikeminnow sampling

The discovery of Colorado pikeminnow upstream near Swinging Bridge in spring 2011 motivated additional Green River sampling in Browns Park National Wildlife Refuge on 21-22 June via boat electrofishing. Two crews sampled from Swinging Bridge downstream 14 miles to Vermillion Creek, a tributary to the Green River a short distance upstream of the boundary of Dinosaur National Monument. High flows benefitted sampling efforts because of increased access to productive habitats. One adult pikeminnow was captured in the Green River near Crook Campground. High Green River flows also allowed access to the lower end of Vermillion Creek, where an additional 8 adult pikeminnow (23-27 inches, 595-692 mm total length,) were captured; at least three more were observed but not captured. In all, only five pikeminnow had been previously tagged and two of those were tags with number series that have not been used for many years, which may indicate that those fish reside in that section of the Green River for substantial periods of the year. Vermillion Creek, a relatively small, turbid, and low flow system, was relatively warm at 72°F (22°C) compared to the Green River (48°F, 9°C); during these captures several individual pikeminnow were tuberculate (nearing reproductive readiness) likely because of the warm water. High reproductive condition for pikeminnow was not expected because of high, late, and cold flows and because pikeminnow in the downstream Yampa River did not spawn until late July in 2011. Very high densities of suckers, both native flannelmouth sucker, non-native white sucker, and their hybrids, were also captured. Findings supported the importance of floodplain wetlands and flooded tributary mouths for enhancing condition of endangered fishes like Colorado pikeminnow. In spring 2012, we captured three additional pikeminnow at or in the mouth of Vermillion Creek, in spite of relatively low effort. Consecutive years of capture at that location suggest that the mouth of Vermillion Creek may be a concentration area for pikeminnow in spring.

In spring 2014, we captured six Colorado pikeminnow in or at the mouth of Vermillion Creek in fyke nets; an additional pikeminnow was captured at Beaver Creek. Captures were from 28 May to 11 June and each fish was captured only once. Colorado pikeminnow ranged in length from 502 – 756 mm TL (1162-4309 g) and six of the seven were previously tagged; one was tagged for the first time. One of those individuals that we captured (8 June) was also detected by a PIT tag detection array set in Vermillion Creek a few days earlier (4 June). Two additional individuals were also detected by arrays, but we did not capture those fish. Thus, a total of nine Colorado pikeminnow adults was encountered in 2014 between 1-16 June and eight were from Vermillion Creek.

On 3 June, flows increased from Flaming Gorge Dam to 4,350 cfs, peaked on 7 June at 9,090 cfs and by 18 June flows were declining to or were below Flaming Gorge Dam maximum powerplant flows of 4,650 cfs or less. One pikeminnow was detected in the mouth of Vermillion Creek on 28 May at low base flows of 872 cfs. All pikeminnow except the first one were captured in or near Vermillion Creek

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

during high flows (2-18 June) when the mouth of Vermillion Creek was inundated, and the Green River was cold (about 10°C). Vermillion Creek was warm and > 20°C for most of that high flow period.

In 2015, 17 individual Colorado pikeminnow (483–713 mm, 1300–3650 g) were captured in Browns Park. Of these, 12 were captured in Vermillion Creek within 100 m of the mouth over a span of five days (4 – 8 June). Four of the Vermillion Creek individuals were captured twice or more during this time. The remaining five Colorado pikeminnow were captured throughout the Refuge at State Line backwater (n = 1), Beaver Creek (n = 2), near Spitzie Bottom (n = 1), and in a backwater above Crook Campground (n = 1). Only three individuals were not tagged; these were given new PIT tags at capture. With the exception of one individual angled at Beaver Creek, all were captured with trammel nets. The Vermillion Creek individuals were captured after high-volume releases from Flaming Gorge had concluded, and water temperatures at the time of capture ranged from 13.9 to 24.4°C. Daytime main channel temperatures were not taken during this time but just downstream, minimum and maximum daily water temperatures were cooler at about 13-17°C (Figure 1b).

In 2016, two electrofishing trips were conducted through Browns Park in June to access backwaters and other habitats otherwise inaccessible for trammel netting. On 3 June, sampling was conducted with a raft-based Smith Root GPP electrofisher between the Swinging Bridge and Crook Campground boat ramps (river miles 380.4 to 372.2) and focused on backwaters and vegetated shoreline on the left bank. Sampling for this trip totaled 9,177 seconds. On 18 June, sampling was conducted from the Crook Campground boat ramp to just below Vermillion Creek (river miles 372.2 to 366.1), focusing on backwaters and vegetated shoreline on both banks and on the lower 400 meters of Vermillion Creek. Sampling totaled 1,398 seconds upstream of Vermillion Creek, 1,446 seconds in Vermillion Creek, and 368 seconds downstream. No northern pike were captured during this sampling effort.

Also 2016, all 10 Colorado pikeminnow captured with electrofishing and trammel nets were captured in the lower 400 meters of Vermillion Creek during higher flow releases from Flaming Gorge Dam; one of these individuals was captured twice. During trammel netting in Vermillion Creek, water temperatures were between 17.0 and 20.9°C. Main channel Green River water temperatures were not taken on those days, but were measured between 8.1 and 9.9°C during June sampling. Two PIT tag antennas were deployed in lower Vermillion Creek to learn more about use of the tributary by Colorado pikeminnow and other tagged species of interest in the river. A total of 62 detections were made by the antennas, comprising 24 individuals. Of these fish, 20 were Colorado pikeminnow and one was a flannelmouth sucker. The species of the remaining three individuals are currently unknown. Five of the Colorado pikeminnow captured in Vermillion Creek (four by trammel nets and one by boat electrofishing) were also detected by the PIT tag antennas between 27 May and 17 June. Individuals detected by the PIT tag antennas were detected between 1 and 9 times, with a mean detection frequency of 2.7 times.

In 2017, we set two wagon wheel-type PIT tag detectors in Vermillion Creek, one near the mouth and the other upstream near the creek inflow to the large backwater formed by high flows from the Green River. The results were surprising, as we documented over 28,000 hits from PIT tags on the two detectors, with nearly 75% of those from a single fish. The biggest finding was presence of 74 individual Colorado pikeminnow documented in the spring period in Vermillion Creek. Additional fish detected included 10 flannelmouth suckers and one flannelmouth x bluehead sucker hybrid.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Some of the 2017 Colorado pikeminnow detected were also found within a month later either at or near the Colorado pikeminnow spawning area in lower Yampa Canyon, and at least three were detected by PIT antennas in downstream Tusher diversion. A total of 10 PIT tags were unidentifiable either because they were never recorded or are not in any available database.

Also notably absent were any fishes that may have been passed through Flaming Gorge Dam into the Green River from Flaming Gorge Reservoir. Opportunities for escapement were likely higher in 2017 than in the past due to high and extended releases throughout the spring and early summer. Kokanee salmon, burbot, Utah chub, and lake trout are among the taxa that might be expected escaping from Flaming Gorge Dam, each of which has been detected in past sampling either in this study or other locations downstream.

A total of five Colorado pikeminnow were captured in Vermillion Creek in 2018 with trammel nets, and all on 2 June. Relatively brief and low flows, especially compared to 2017, may have restricted use of lower Vermillion Creek in 2018. The same two wagon wheel-type PIT tag detectors were placed in the same locations in Vermillion Creek on 16 May 2018 to learn more about use of the tributary by Colorado pikeminnow and other tagged fishes in the river. They remained in place until 14 June and were actively detecting through at least 6 June. The two antennas logged 589 detections from 13 individual fish. Nine of those were Colorado pikeminnow, and included three of the five fish captured by trammel nets, so a total of 11 individual pikeminnow were noted in 2018. Colorado pikeminnow detections were from 16 May to 6 June. Three flannelmouth suckers were also detected, and one detected tag remains unidentified. With the exception of one flannelmouth sucker, all fish detected in Vermillion Creek in 2018 were detected there in 2017. Three of the Colorado pikeminnow and the one unidentified fish were detected in the Yampa River with antennas between 4 June and 23 June following their last detection in Vermillion Creek.

In 2019, trammel netting in Vermillion Creek yielded a single Colorado pikeminnow capture. That individual was untagged, and was released after tagging. Two submersible PIT tag antennas were deployed in Vermillion Creek on 24 April 2019 in the same locations as previous years. They remained in place until 4 July, and were actively detecting tagged fish for the entire period. A total of 19 individual fish generated 277 detections. Detected fish consisted of 15 Colorado pikeminnow (including the individual we tagged), one flannelmouth sucker, and three unidentified individuals. Including the individual we tagged, four of the Colorado pikeminnow we detected had never been detected in Vermillion Creek before and three had never been encountered in Browns Park. All detections occurred between 24 April and 21 June. Of the Colorado pikeminnow detected in Vermillion Creek, six were later detected in the Yampa River by PIT tag antennas at RMs 0.3, 0.5, 16.4, and 16.6 between 18 June and 17 July. One was detected by the PIA in Tusher Diversion at Green River mile 129.3 on both 19 and 20 July.

In 2020, trammel netting in Vermillion Creek yielded a single Colorado pikeminnow capture. Two submersible PIT tag antennas were deployed in Vermillion Creek on 23 May prior to high flow releases and remained there until 16 June, when flows had declined to base levels. One antenna was placed at the confluence of the Green River, and another upstream about 100 m, both typical locations. A total of 19 individual fish generated 423 detections. Detected fish consisted of 11 Colorado pikeminnow, one flannelmouth sucker, and 4 unidentified individuals. All pikeminnow captured and detected were previously encountered in Vermillion Creek.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Task 3: Sample small-bodied fish community.

Nearly 200 seine samples were collected in the study area from middle Browns Park downstream to the lower end of Rainbow Park during summer and autumn 2020. We have begun identification of summer and autumn samples, as we finish verification of 2019 samples. We will update seine capture data in the synthesis report when fish in samples are identified and cataloged.

An additional task in this scope of work was to analyze otoliths from age-0 smallmouth bass captured in the Green River study area. This work will assist with understanding smallmouth bass spawning periodicity to assist with disruption of reproduction of that species via flow releases from Flaming Gorge Dam. Studies in other parts of the range of smallmouth bass have shown that weather-related water temperature reductions or floods reduce their spawning success and number of offspring (See references in Bestgen and Hill 2016, Bestgen 2018; the flow spike study plan). Reduced water temperatures often result in abandonment of spawning nests by the guarding male bass, after which developing eggs and just-hatched young are susceptible to predation and other mortality factors. Sampling in the Green River and other areas has shown that higher stream flow, often coupled with increased water turbidity, sweeps weak-swimming young bass away from nests or quiet near-shore habitat, and results in high mortality.

Portions of this work were reported at the January 2010-2018 Researchers Meetings. We found that smallmouth bass in the Green River-Lodore Canyon study area first hatched well after spring peak releases declined and just slightly after (usually within one week) mean daily water temperatures regularly exceeded 16°C in the period 2003-2012. Hatching date distributions were very similar in 2008 and 2009, reflecting the similar flow and temperature regimes in those years. Hatching date and the extent of the reproductive season was much shorter in 2011 when high flows were relatively cool, and hatching did not begin in 2011 until after bass had finished hatching in nearly every other year. The 2012 water temperatures suggest a relatively late initiation of hatching as well, and that is supported by capture of very few and relatively small bass in Lodore Canyon in a late-July sampling trip.

We prepared a report that synthesizes smallmouth bass hatching date distribution and growth data (Bestgen and Hill 2016). We also prepared a study plan to use flow spikes to disrupt smallmouth bass spawning success downstream of Flaming Gorge Dam. That study plan was completed and approved by the Biology Committee in early November 2018. That report has been finalized and submitted to the Recovery Program. Elements of the report will be used to develop an evaluation of success of flow and water temperature recommendations to bolster native fish populations in the Green River.

Drift net sampling documented high downstream displacement of small-bodied smallmouth bass during high turbidity and flow events in 2004 and 2007. Such flow and turbidity events may have been responsible for low abundance of smallmouth bass < 100 mm TL in summer 2004, and subsequent low number of Age-1 smallmouth bass in 2005 (data in RIP annual reports; Badame et al. synthesis report; discussion in Bestgen et al. 2006; 2007; Bestgen and Hill 2016). Unfortunately, high flows in 2011 prevented sampling of the Green River because sampling crews were unable to cross the very high Yampa River to reach the Green; drift sampling in 2012 and 2014-2020 was completed for portions of the summer but few smallmouth bass were captured.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Task 4: Sample larval drift and process samples.

We collected 132 Green River drift net samples from 4 July to 16 August in 2020. The 2020 drift samples have not yet been identified.

Task 5: Identify, count and measure preserved samples of small-bodied fish (seine hauls).

We have completed identification of 2018 samples, are progressing with verification of 2019 samples, and are beginning first identification of 2020 samples.

Task 6. Smallmouth bass flow disruption studies. In response to expanded populations of smallmouth bass in the upper Colorado River basin, and especially in the upper Green River basin, investigators have sought ways to reduce negative impacts of bass on native fishes. One means to reduce smallmouth bass abundance over reach-wide scales may be to institute flow spikes timed with bass reproduction, so that numbers of young produced are diminished. Flow spikes conducted over a series of years may ultimately reduce bass abundance and benefit recovery of native fishes. The methods to accomplish a flow spike were outlined in a detailed study plan (Bestgen 2018).

To study the potential effects of a flow spike on side-channel connection flows, and by association proxy, smallmouth bass, we conducted surveys of habitat in Lodore Canyon and downstream Island Park, in summer 2019, which were reported in that annual report. Although we did not conduct additional measurements in 2020, we verified flow connection levels at some locations, which reinforced the veracity of the relationships derived from 2019 sampling.

Task 7: Prepare and submit annual report.

This report. Need to finalize the summary report for the synthesis of data available since the inception of this study.

Additional noteworthy observations: Continued use by Colorado pikeminnow of lower Vermillion Creek. The low abundance of northern pike in Browns Park was somewhat surprising in 2018-2020 given high abundance of young northern pike following high and extended 2017 flows in the Browns Park reach of the Green River, and downstream. In contrast, pike numbers were exceeded in Lodore Canyon in 2020 in only one other year, 2005. Perhaps some of those fish derived from the 2017 Green River year class, or were immigrants from the Yampa River.

Recommendations: Continue with sampling in 2021. Implement findings of the smallmouth bass synthesis report and recommendations in the flow spike study plan to disadvantage smallmouth bass using flow spikes in the Green River.

Project Status: On track and ongoing. The synthesis report is ongoing and should be ready for review in early 2021.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2020 Budget Status:

Funds Provided: 108,900

Funds Expended: 100,623

Difference: 8,277

Percent of the FY 2020 work completed, and projected costs to complete: About 85% complete, no additional funds needed

Recovery Program funds spent for publication charges: None

Status of Data Submission:

Data have been submitted to STREaMS.

Signed:

Kevin R. Bestgen

Principal Investigator

3 December 2020

References

Bestgen, K. R. 2018. Evaluate effects of flow spikes to disrupt reproduction of smallmouth bass in the Green River downstream of Flaming Gorge Dam. Final report to the Upper Colorado River Endangered Fish Recovery Program. Denver, Colorado. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins. Larval Fish Laboratory Contribution 214. DOI: 10.13140/RG.2.2.33277.61926

Bestgen, K. R., and A. A. Hill. 2016. River regulation affects reproduction, early growth, and suppression strategies for invasive smallmouth bass in the upper Colorado River basin. Final report to the Upper Colorado River Endangered Fish Recovery Program, Project FR-115, Denver, CO. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins. Larval Fish Laboratory Contribution 187. DOI: 10.13140/RG.2.2.29635.20009

Bestgen, K. R., K. A. Zelasko, and C. T. Wilcox. 2007. Non-native fish removal in the Green River, Lodore and Whirlpool canyons, 2002-2006, and fish community response to altered flow and temperature regimes, and non-native fish expansion. Final report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin. U. S. Fish and Wildlife Service, Denver, CO. Larval Fish Laboratory Contribution 149.

Bestgen, K. R., K. A. Zelasko, R. I. Compton, and T. Chart. 2006. Response of the Green River fish community to changes in flow and temperature regimes from Flaming Gorge Dam since 1996 based on sampling conducted from 2002 to 2004. Final report submitted to the Biology Committee, Upper Colorado Endangered Fish Recovery Program. Larval Fish Laboratory Contribution 144. DOI: 10.13140/RG.2.2.34629.04323

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Table 1.—List of fishes captured in the Green River, from Browns Park downstream to Rainbow Park with electrofishing, trammel nets, and seining, 2002-2019. White crappie is new to the list beginning in 2016. N = native, I = introduced.

Species	Status	Electrofishing	Trammel netting	Seining
Mountain whitefish	N	X	X	X
Humpback chub	N	X	X	
Bonytail	N	X	X	X
Roundtail chub	N	X	X	X
Colorado pikeminnow	N	X	X	X
Speckled dace	N	X		X
Bluehead sucker	N	X	X	X
Flannelmouth sucker	N	X	X	X
Razorback sucker	N	X		X
Mountain sucker	N			X
Mottled sculpin	N	X		X
Cutthroat trout	I	X		
Brook trout	I	X		
Rainbow trout	I	X	X	X
Brown trout	I	X	X	X
Northern pike	I	X	X	X
Red shiner	I	X		X
Common carp	I	X	X	X
Creek chub	I			X
Fathead minnow	I			X
Sand shiner	I			X
Redside shiner	I	X		X
White sucker	I	X	X	X
WS x FM	I	X	X	X
FM x BH	I	X	X	X
WS x BH	I	X	X	X
RZB x FM	I	X		X
Channel catfish	I	X	X	X
Black bullhead	I	X		X
Bluegill	I	X		X
Green sunfish	I	X		X
Smallmouth bass	I	X	X	X
Black crappie	I	X	X	X
White crappie	I			X
Walleye	I	X		
Iowa darter	I			X

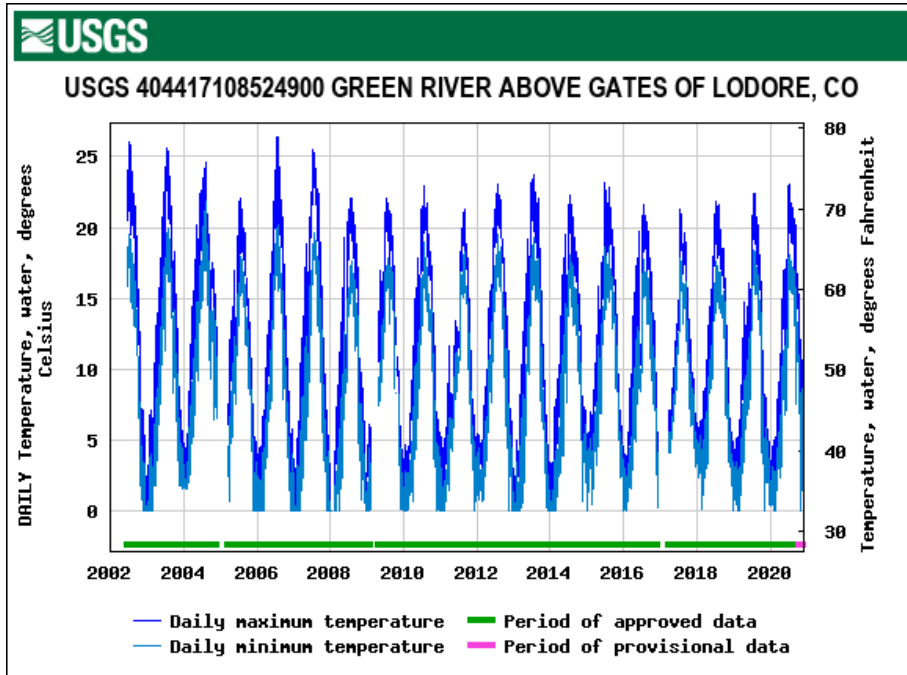
UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Table 2. Number of fishes captured by electrofishing sampling trip (July and September) in the Lodore (LD) and Whirlpool Canyon (WH) reaches of the Green River, 2020.

Species	July LD	July WH	Sept LD	Sept WH	July total	Sept total	LD total	WH total	Total
brown trout	251	13	367	29	264	396	618	42	660
bluehead sucker	26	181	8	71	207	79	34	252	286
white sucker	51	9	191	12	60	203	242	21	263
flannelmouth sucker	78	39	20	19	117	39	98	58	156
mountain whitefish	27	10	74	31	37	105	101	41	142
smallmouth bass	2	36	2	67	38	69	4	103	107
channel catfish	8	33	3	7	41	10	11	40	51
common carp	23	4	11	2	27	13	34	6	40
mottled sculpin	1	2	14	19	3	33	15	21	36
rainbow trout	6	7	6	14	13	20	12	21	33
flannelmouth sucker x white sucker	11	2	8	0	13	8	19	2	21
white sucker x flannelmouth sucker	0	0	11	3	0	14	11	3	14
northern pike	1	0	12	0	1	12	13	0	13
speckled dace	1	1	2	1	2	3	3	2	5
bluehead sucker x white sucker	1	3	0	0	4	0	1	3	4
green sunfish	0	0	0	4	0	4	0	4	4
Colorado pikeminnow	2	0	1	0	2	1	3	0	3
reeside shiner	0	0	1	1	0	2	1	1	2
flannelmouth sucker x bluehead sucker	0	1	0	0	1	0	0	1	1
creek chub	0	0	1	0	0	1	1	0	1
red shiner	0	0	0	1	0	1	0	1	1
Total	489	341	732	281	830	1013	1221	622	1843

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

A.



B.

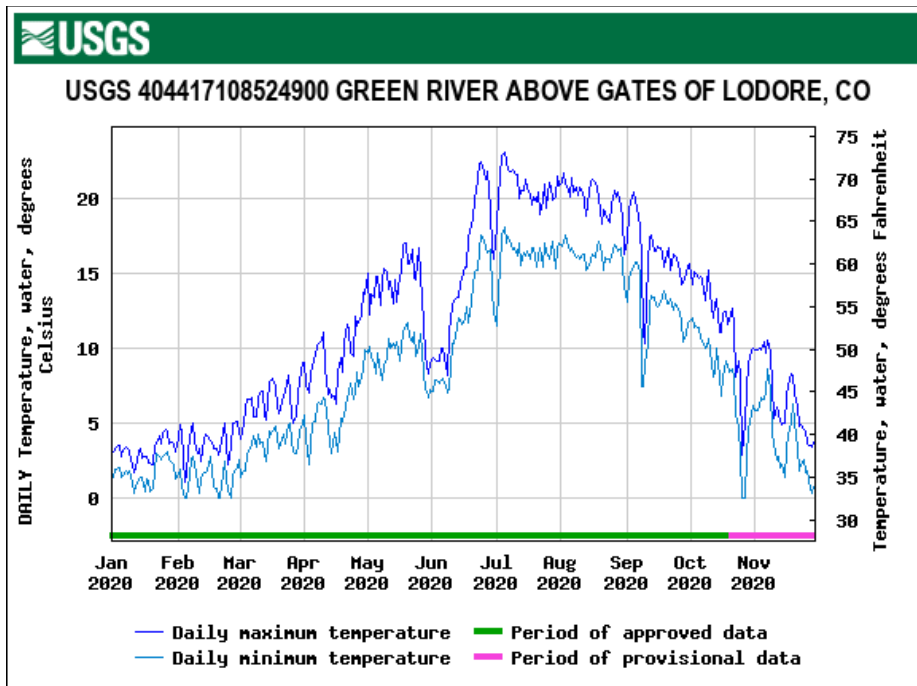
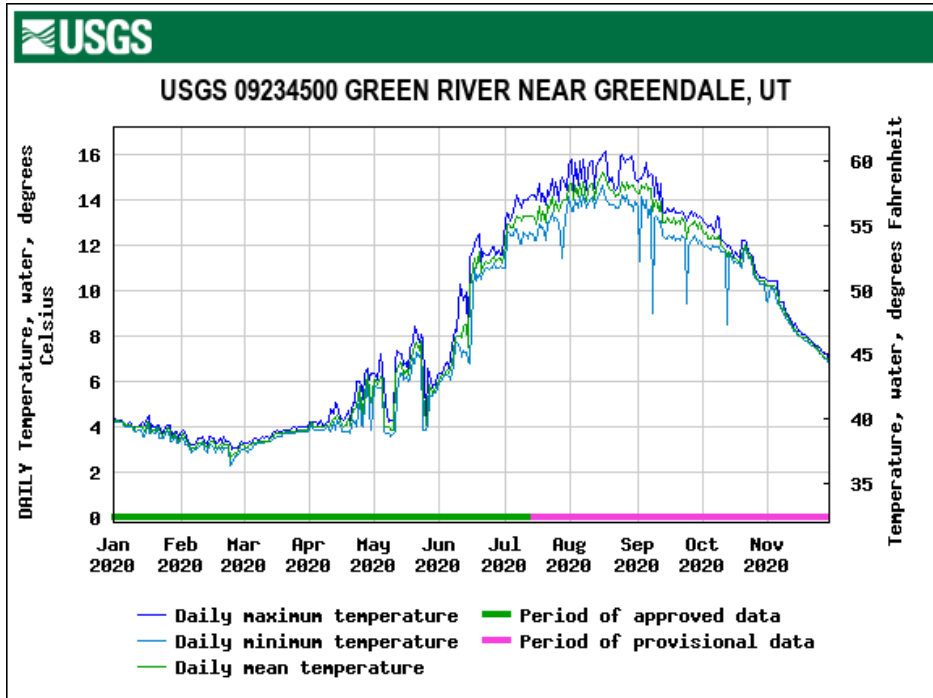


Figure 1 in part, described below

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

C.



D.

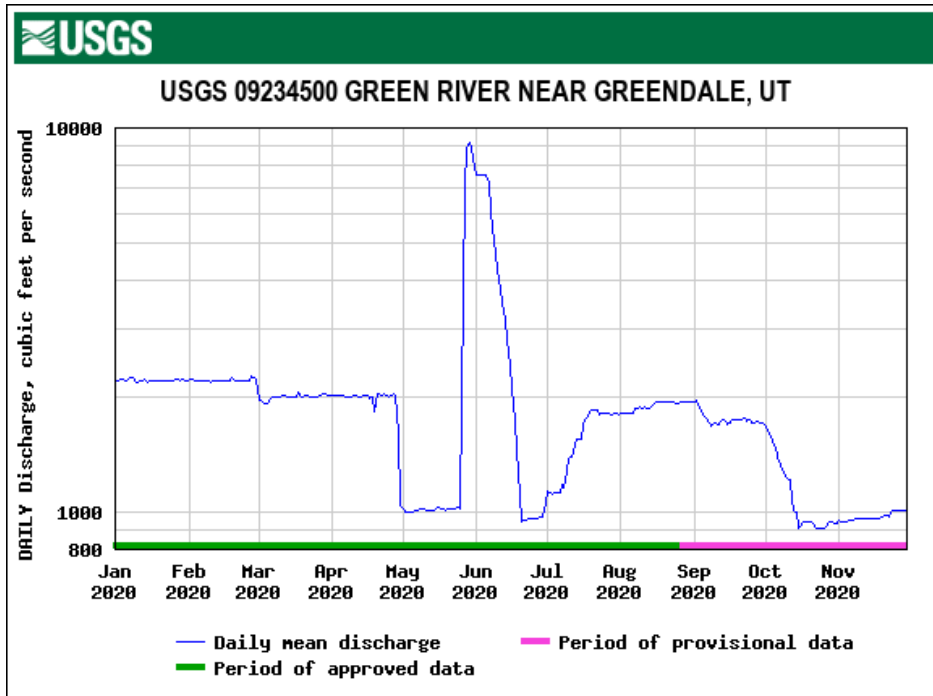
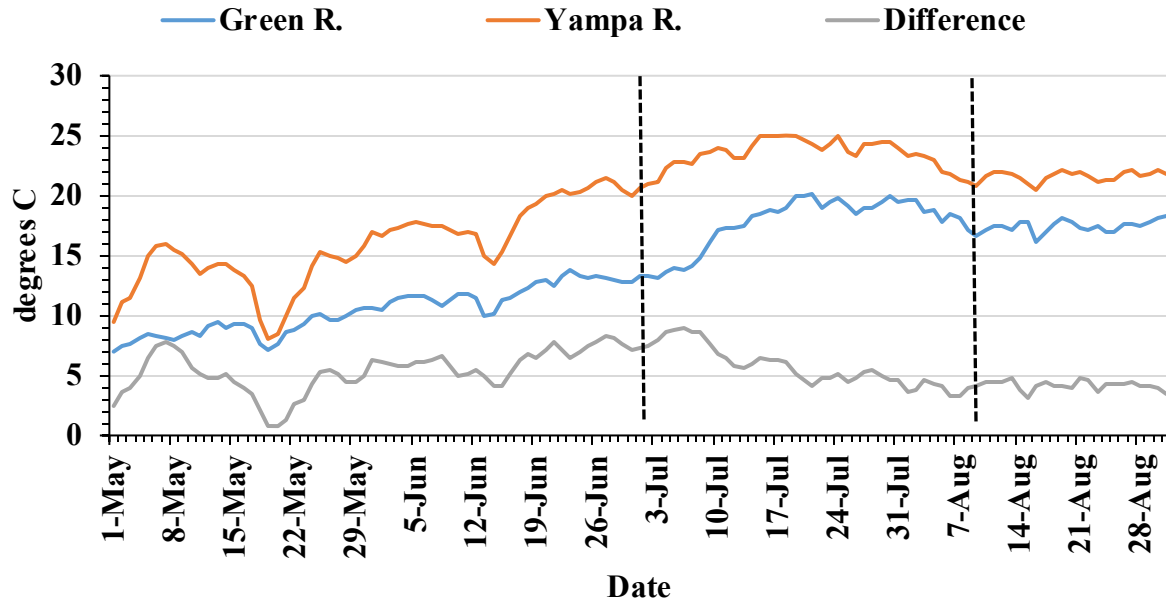
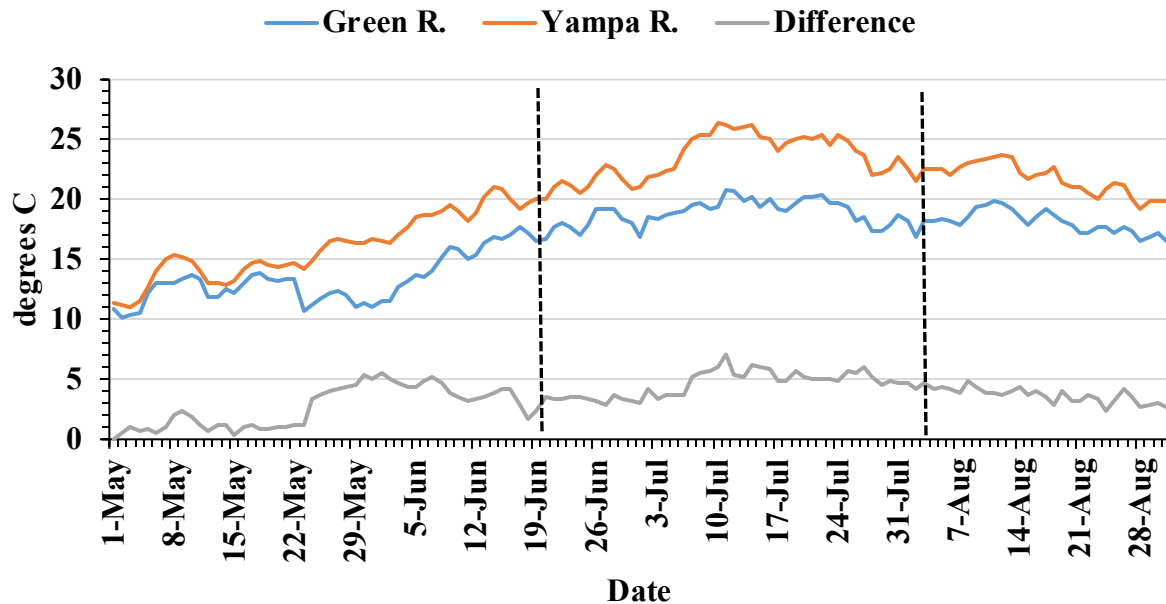


Figure 1. Green River water temperatures at the Gates of Lodore, near the Dinosaur National Monument campground, June 2002- November 2020 (Panel A, preceding pages) and in 2020 (Panel B). Panels C and D portray mean daily water temperature and flow, respectively, for 2020 at the Greendale gauge just downstream of Flaming Gorge Dam.

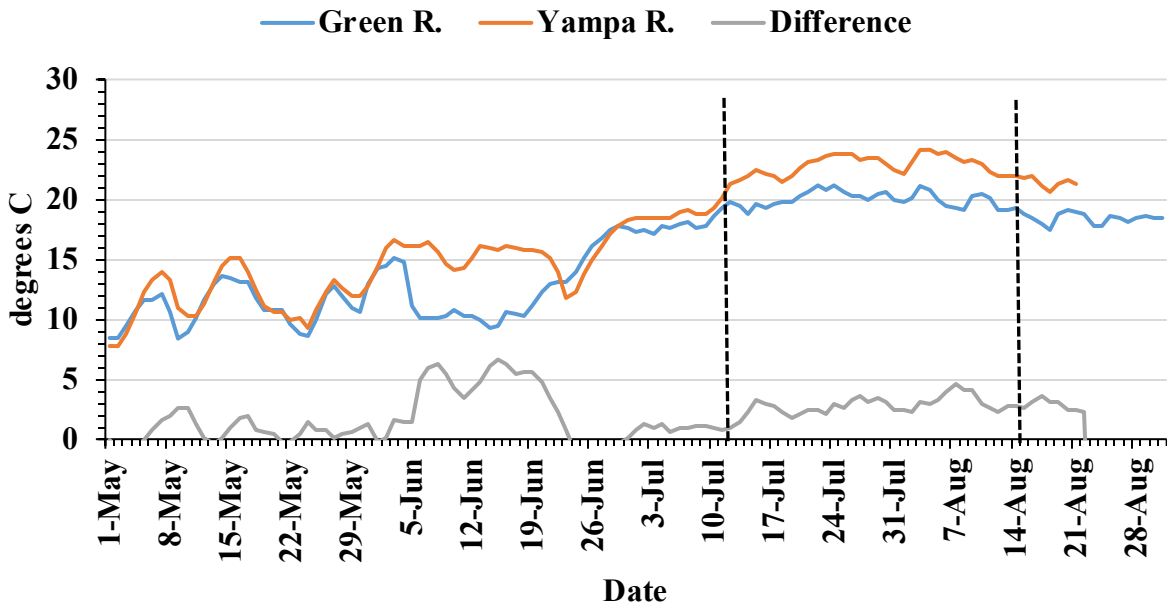
Green R.-Yampa R. water temperatures, 2017



Green R.-Yampa R. water temperatures, 2018



Green R.-Yampa R. water temperatures, 2019



Green R.-Yampa R. water temperatures, 2020

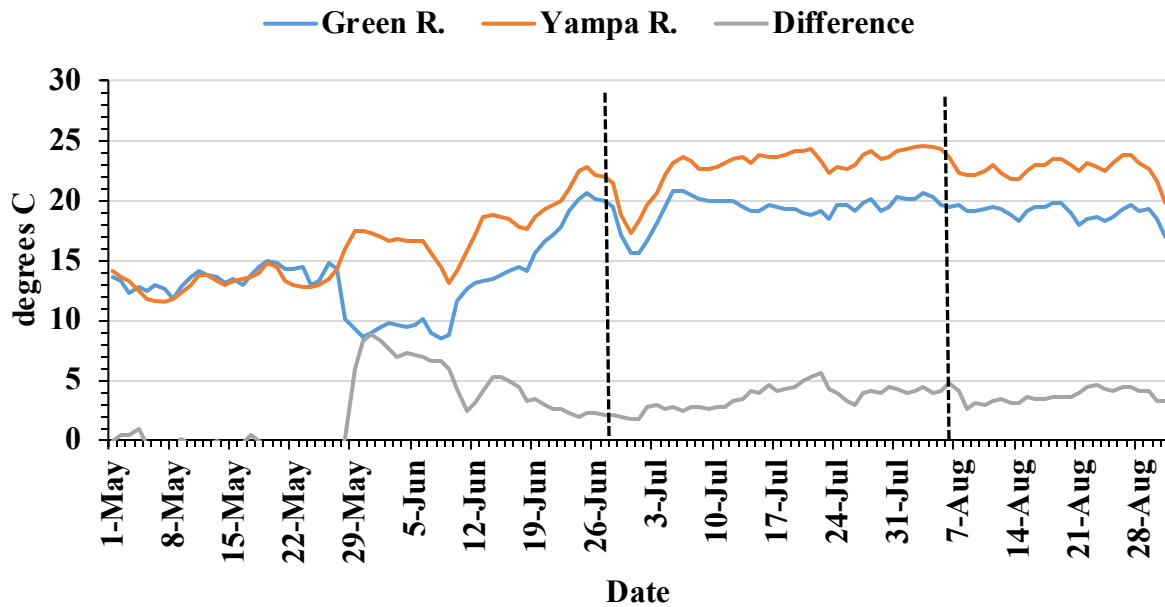


Figure 2. Water temperature differences between the Green River (USFWS gage just upstream of the Yampa River in Echo Park) and the Yampa River (USFWS just upstream of the Green River in Echo Park), late spring and summer 2017-2020. Data were from the Upper Colorado River Endangered Fish Recovery Program website. The dashed lines represent the estimated period of first to last presence of Colorado pikeminnow larvae in the lower Yampa River (Project 22f annual report); the last date for 2020 Colorado pikeminnow capture was estimated because samples to describe that are not yet identified. Water temperature differences in 2020 exceeded 5C on two days.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

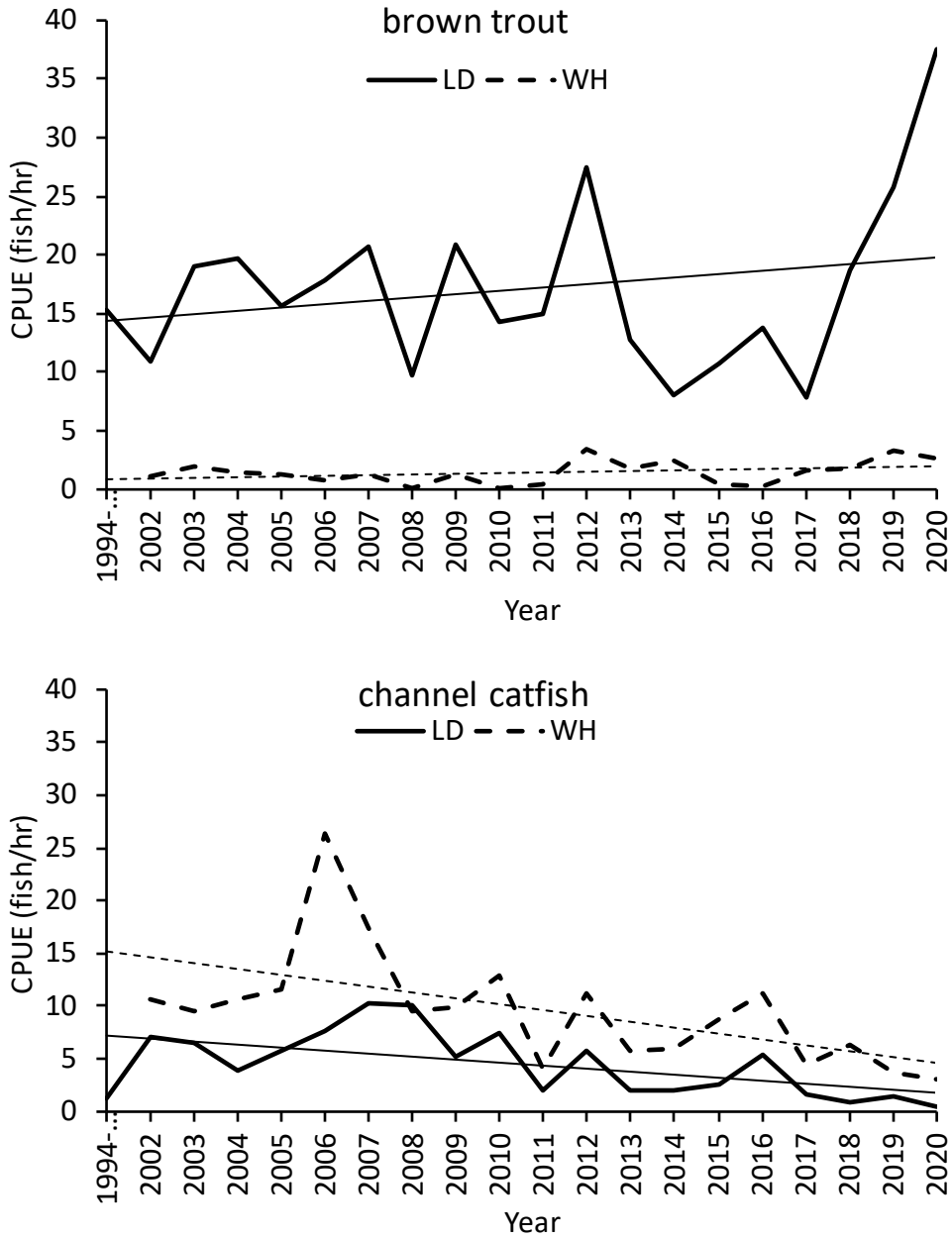


Figure caption below

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

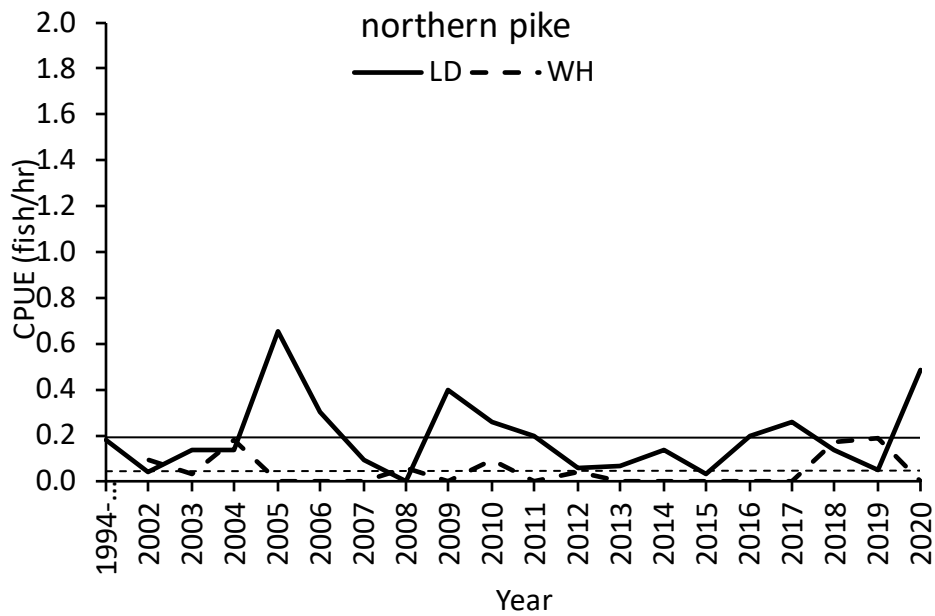
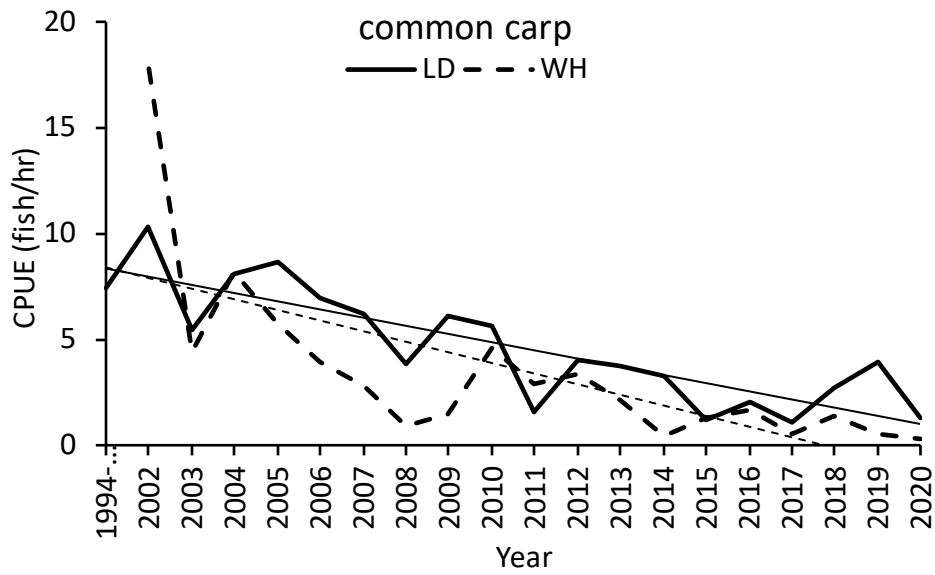


Figure caption below

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

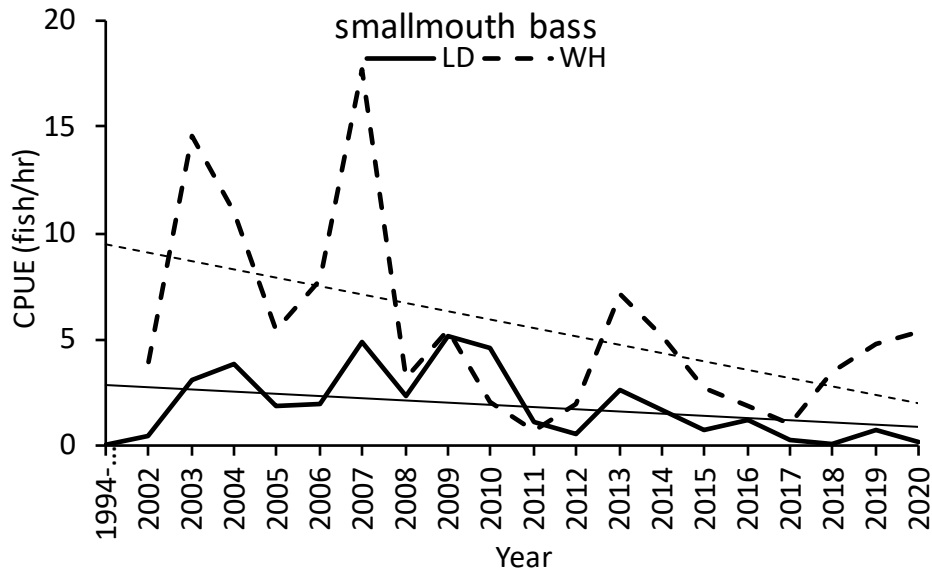


Figure 3.—Number of brown trout, channel catfish, common carp, northern pike, smallmouth bass, and white sucker captured per hour of raft electrofishing effort in Lodore Canyon and Whirlpool Canyon, Green River, Colorado and Utah, in from 1994-2020. LD is Lodore Canyon and WH is Whirlpool Canyon.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

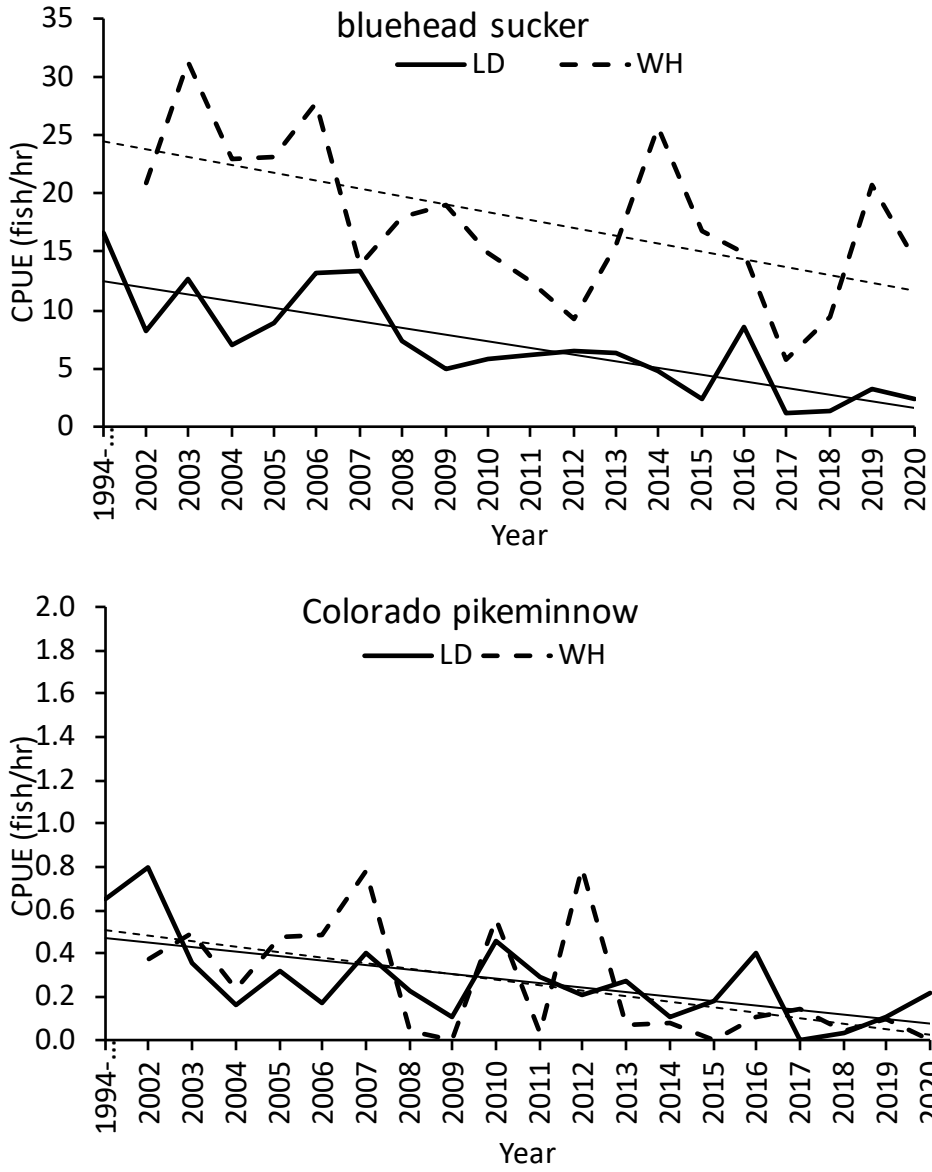


Figure caption below

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

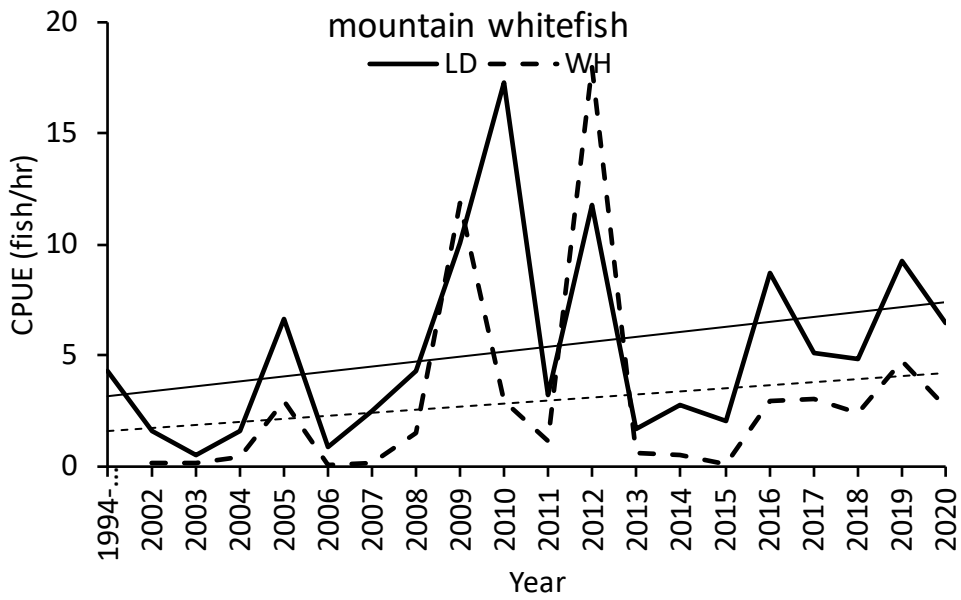
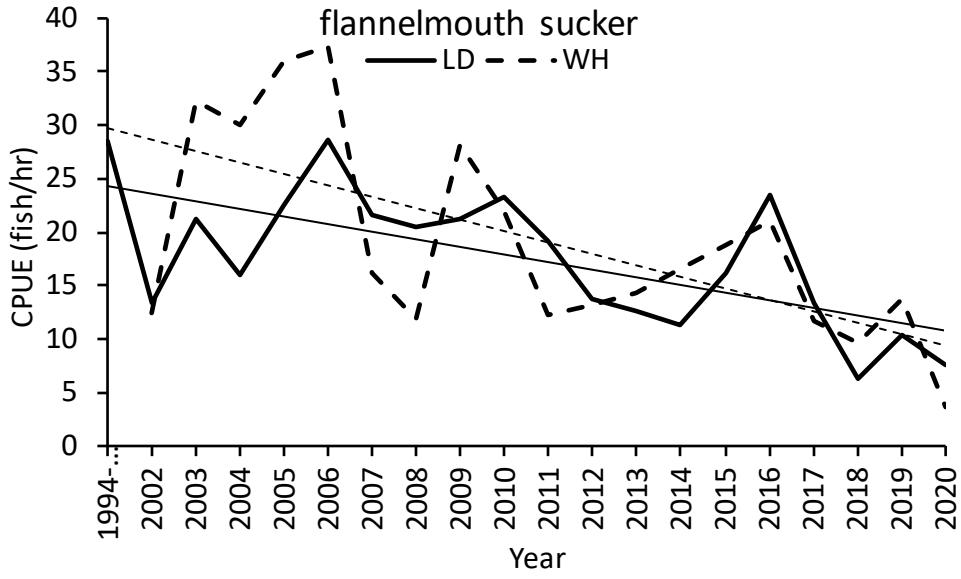


Figure caption below

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

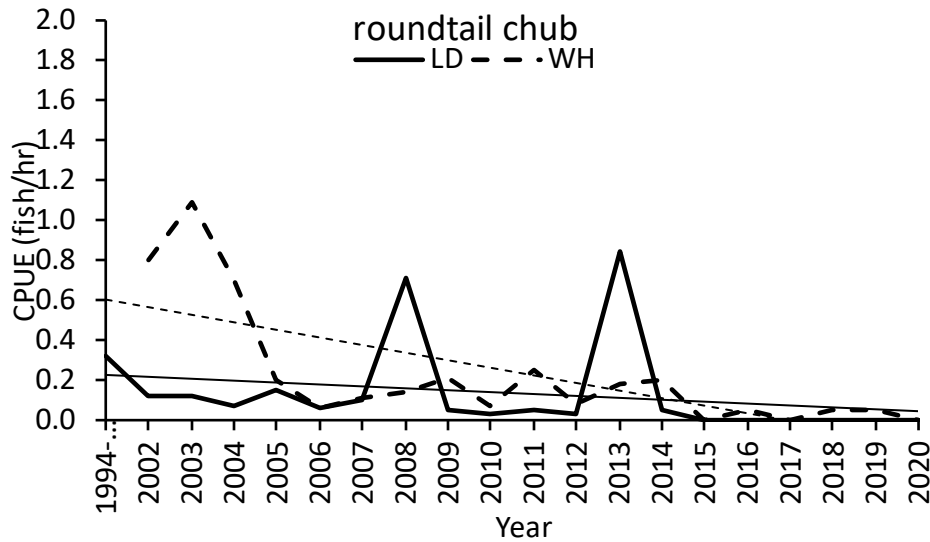


Figure 4.—Number of bluehead sucker, Colorado pikeminnow (lines for reaches overlay each other), flannelmouth sucker, mountain whitefish, and roundtail chub captured per hour of raft electrofishing effort in Lodore Canyon and Whirlpool Canyon, Green River, Colorado and Utah, from 1994-2020. LD is Lodore Canyon and WH is Whirlpool Canyon.

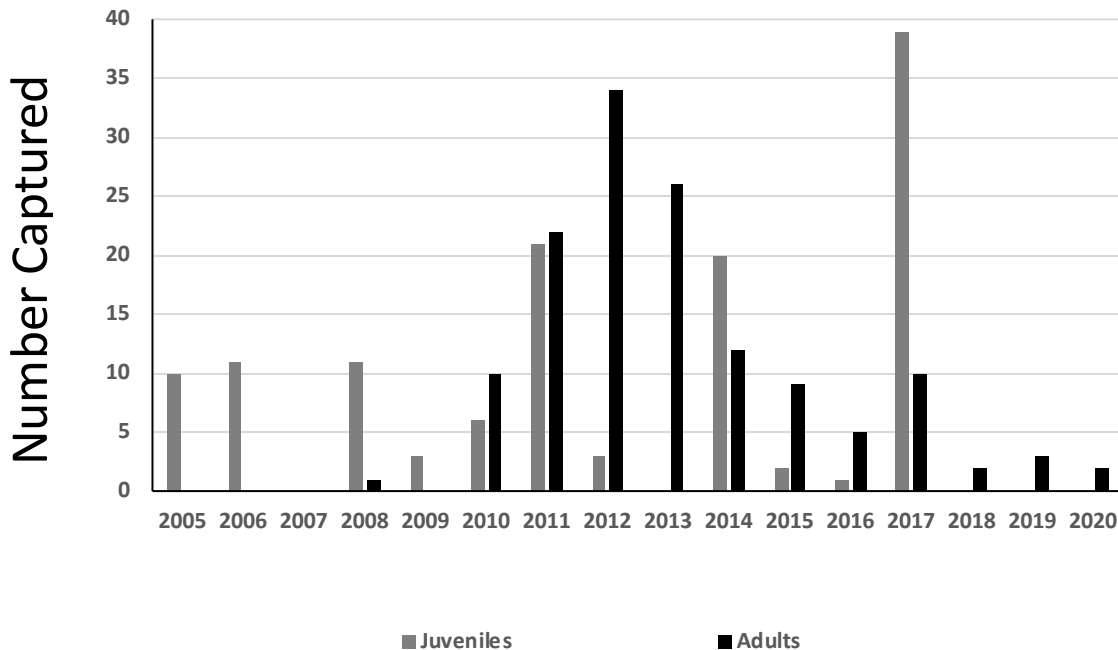


Figure 5. Annual captures of adult (350 mm TL or greater) and juvenile (< 350 mm) northern pike in the Green River, Browns Park, Colorado.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R19AP00058

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: FR-115

Project Title:

Monitoring effects of Flaming Gorge Dam releases on the Lodore and Whirlpool Canyon fish communities

Principal Investigator:

Kevin Bestgen, Edward Kluender, Koreen Zelasko
Larval Fish Laboratory
Department of Fish, Wildlife, and Conservation Biology
Colorado State University
Ft. Collins, CO 80523
voice: KRB (970) 491-1848
fax: (970) 491-5091
email: kbestgen@colostate.edu

Bureau of Reclamation Agreement Number:

R19AP00058

Project/Grant Period:

Start date (Mo/Day/Yr): 1 Oct. 2018
End date: (Mo/Day/Yr): 30 Sept. 2023
Reporting period end date: 30 Sept. 2020
Is this the final report? Yes _____ No X

Performance:

The Larval Fish Laboratory completed two sampling trips with assistance from the USFWS, Vernal, Utah. Samples were collected and preserved and data on large-bodied fishes was collected. Samples are being identified and data are yet being analyzed, as some information was only recently collected. We also produced an annual report on activities and will prepare presentations based on data at workshops or meetings in January 2020.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R20PG00024

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: FR-115

Project Title:

Monitoring effects of Flaming Gorge Dam releases on the Lodore and Whirlpool Canyon fish communities

Bureau of Reclamation Agreement Number:
R20PG00024

Project/Grant Period:

Start date: 10/1/2019

End date: 9/30/2024

Reporting period end date: 9/30/2020

Is this the final report? Yes _____ No X

Performance:

US Fish and Wildlife Service provided personnel and equipment to assist CSU LFL in completing two electrofishing and seining passes from the Gates of Lodore through Rainbow Park, thereby fulfilling our commitments to tasks 1 and 2. Trammel netting in Whirlpool Canyon, which is typically conducted on a separate trip, was combined with the second pass this year.