

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2021 ANNUAL REPORT

PROJECT: 125/98c

Project Title: Evaluation of Smallmouth Bass and Northern Pike management in the middle Yampa River.

Bureau of Reclamation Agreement Number:
R19AP00058

Project/Grant Period:

Start date: 10/01/2018

End date: 09/30/2023

Reporting period end date: 09/30/2021

Is this the final report? Yes _____ No X

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Abstract:

This study was an evaluation of whether Smallmouth Bass *Micropterus dolomieu* numbers can be controlled through active removal from reaches of the Yampa River that are critical habitat for Colorado Pikeminnow *Ptychocheilus lucius*. The study area included 103.5 miles of the middle Yampa River from near Craig, Colorado (River Mile, RM 151.0) to Dinosaur National Monument (RM 47.5) and was divided into eight reaches. Boat electrofishing to remove Smallmouth Bass in the middle Yampa River occurred on up to five occasions from mid-May to mid-June using two electrofishing Jon-boats or rafts that sampled both shorelines. Smallmouth Bass ≥ 100 mm were marked and released on one occasion in Little Yampa Canyon (RM 124.0-100.0) to estimate their abundance, evaluate how the population responds to removal, and monitor fish movement and growth. Using mark-recapture methods, we estimated 667 adult Smallmouth Bass (260—1074, 95% CI; CV=31%) inhabited Little Yampa Canyon in 2021. Based on abundance estimates, density in Little Yampa Canyon was 28 adult Smallmouth Bass per mile. Sub-adult density was not obtained because there were no sub-adults caught on the recapture pass. Although the population of adults in 2021 was a little over twice as many as we estimated in 2020, the adult population of Smallmouth Bass in Little Yampa Canyon remains lower than most prior years. The increase in adults may be partially due to reduced removal effort in all reaches in 2020 due to Covid travel restrictions. Effort was also reduced in 2021 due to a short runoff period that reduced sample occasions. In addition, an early and short runoff in 2021 produced a strong cohort of young bass that grew quickly during the long, warm growing season. For these reasons, the number of sub-adult and adult Smallmouth Bass are likely to increase in the next few years as the 2020 and 2021 cohorts recruit to adult size. Using boat electrofishing, we removed 3,749 bass from eight reaches of the middle Yampa River. We removed an additional 895 bass by angling and 7,003 bass using an electric seine and backpack electrofisher from late June through October. We also removed Northern Pike *Esox lucius* from the middle Yampa River study area

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and those data were provided to Colorado Parks and Wildlife (CPW) biologists who reported the results in the Annual Report for Project # 98a.

Another task (98c) was to remove adult Northern Pike in the spring during their spawning period from the reach between Steamboat Springs and Hayden (RM 194.2—170.6), identify and prioritize spawning areas, and later to capture young pike to confirm reproduction and to estimate spawning dates. We removed 52 adult Northern Pike on three sampling occasions (passes) between May 4 and May 20. Ripe males and females were collected on each sample pass. We collected 93 Young-of-Year Northern Pike with seines on June 14. We will use otoliths from those Young-of-Year fish to determine their age in days since hatching and estimate their hatch and fertilization (spawning) date.

Relationship to RIPRAP:

Green River Action Plan: Yampa and Little Snake rivers

III Reduce negative impacts of nonnative fishes and sport fish management activities (nonnative and sport fish management).

III.B.1 Prevent nonnative fish introduction; reduce invasion and recruitment.

III.B.1.c. (1) Implement remedial measures to reduce pike reproduction in Yampa River.

III.B.2. Control nonnative fishes via mechanical removal.

III.B.2.a. Estimate nonnative abundance, status, trends & distribution (YS I-3).

III.B.2.c. Identify and evaluate gear types and methods to control nonnative fishes (YS I-5)

III.B.2.d. Remove (formerly "and translocate") Northern Pike from the Yampa River. See Hawkins et al. 2005. (YS J-1).

III.B.2.e. Remove (formerly "and translocate") Smallmouth Bass in Yampa River designated critical habitat. (YS J-1).

Accomplishment of FY 2021 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Initial findings and preliminary results for 2021 are provided in the attached Appendix and are subject to change as data are further analyzed.

Task 1	Data, reporting, meetings. Completed
Task 2	Field preparation. Completed
Task 3	Steamboat pike removal. Completed
Task 4a	Early spring, middle Yampa bass and pike removal. Fieldwork not done
Task 4b	Middle Yampa bass and pike removal. Completed with reduced field staff
Task 5	Bass Surge removal. Completed with reduced field staff
Task 6	Young-of-year pike sampling. Completed
Task 7	Young-of year bass removal. Completed
Task 8	Equipment preparation, data entry and analysis. Completed

Additional noteworthy observations:

- In 2021, an early and short peak flow resulted in early spawning and led to a long summer growth period for YOY Smallmouth Bass, with some growing beyond 100 mm, thus transitioning into the sub-adult size class.
- High numbers of juvenile bass in the early spring followed by high sub-adult catch rates in the late summer-early fall of 2021 suggests that the 2020 year class was strong. Those fish will join the 2021 year class and recruit into sub-adult and adult bass over the next few years.

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- Based on annual estimates, the abundance of adult Smallmouth Bass currently remains relatively low even with occasional productive year classes, indicating that past removal efforts were sufficient to constrain the population. Recent reductions of effort might reverse that trend.
- Higher catch rates of adult bass in Lily Park reflect a decrease in effort the past two years and highlights the need for increased effort in 2022.
- Colorado Pikeminnow and Roundtail Chub were rare in the sampled reaches.

Recommendations for Middle Yampa Smallmouth Bass

- Continue using Little Yampa Canyon as a monitoring site with annual mark-recapture studies of Smallmouth Bass abundance.
- Continue intensive Smallmouth Bass nest disruption (The Surge) focusing on major production in areas in the Craig, South Beach, Little Yampa Canyon, Lower Juniper, and Upper Maybell reaches.
- Emphasize increased removal effort in Lily Park in collaboration with other agencies to suppress the dispersal of Smallmouth Bass into downstream Yampa Canyon.

Recommendations for upper Yampa River Northern Pike removal

- Continue to focus Northern Pike removal in backwaters using raft electrofishing.
- Describe physical habitat characteristics of spawning areas.
- Develop a management plan that ranks spawning habitat and possible mitigation measures to reduce access or availability.

Project Status:

On track and ongoing.

FY 2021 Budget Status

Funds Provided: \$399,478 (CSU: \$360,772; FWS-Vernal: \$21,875; FWS-Grd Jct: \$16,831)

Funds Expended: \$399,478

Percent of the FY 2021 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: -none-

Status of Data Submission

Endangered fish capture data and other database records will be submitted by January 30, 2022.

Signed:

John Hawkins

Principal Investigator

Date: 11/16/21

Donald Tuttle

Research Associate

Date: 11/16/21

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Results of the removal of Smallmouth Bass from the middle Yampa River, 2021.

John Hawkins, Donald Tuttle III, Kyle Dick (CSU), Christian Smith (FWS), and Tory Eyre (CPW).

Methods-Middle Yampa SMB removal

Study Site

The study area was primarily within a 103.5-mile reach of the middle Yampa River, between Craig, Colorado (river mile; RM 151.0) and Dinosaur National Monument boundary (RM 47.5) and consisted of eight reaches totaling 96.1 miles of river sampled by Colorado Parks and Wildlife (CPW) and Colorado State University-Larval Fish Laboratory (CSU). Two additional study areas included a 16.5-mile section between Hayden and Craig, Colorado and Juniper Canyon, which was sampled by U.S. Fish and Wildlife Service (FWS) during Smallmouth Bass spawning. Data for Smallmouth Bass captured by those agencies in 2021 are summarized in this report.

Study reaches in the middle Yampa River.

<u>Reach</u>	<u>Agency</u>	<u>RM</u>	<u>Area sampled (miles)</u>
Lily Park	CSU	47.5 -- 55.5	8.0
Sunbeam	CPW	60.6 -- 71.0	10.4
Lower Maybell	CPW	71.0 -- 79.2	8.2
Upper Maybell	CPW	79.2 – 88.7	9.5
Juniper Canyon	FWS	88.7 – 91	2.3
Lower Juniper	CPW	91.0 – 100.0	9.0
Little Yampa Canyon	CSU	100.0 – 124.0	24.0
South Beach	CPW	124.0 – 134.5	10.5
Hayden-Craig	FWS	134.5 – 151.0	16.5

Sampling Methods for Smallmouth Bass removal

Fish sampling occurred with boat electrofishing on up to five occasions (passes) during spring snowmelt runoff in May and June, typically using two electrofishing boats or rafts sampling both shorelines continuously downstream. In prior years, we allocated more effort (increased passes) in reaches with abundant Smallmouth Bass spawning habitat, specifically Craig, South Beach, Little Yampa Canyon, Lower Juniper, and Upper Maybell. Due to low snowpack and flows, effort was lower than previous years. We completed two passes in Craig, five passes in South Beach, three in Lower Juniper, three in Upper and Lower Maybell, one in Sunbeam, and one pass in Lily Park in 2021. Sample passes in Little Yampa Canyon, our monitoring reach, was reduced greatly, because flows quickly declined below 1000 cfs by mid-June, a level that impedes boat electrofishing. We removed and euthanized Smallmouth Bass from all reaches on all sampling occasions except during one pass in Little Yampa Canyon when bass were marked and released to estimate abundance. On the marking pass, Smallmouth Bass ≥ 100 -mm total length were marked with a numbered, purple, Floy-tag and released. We also sampled Little Yampa Canyon and Juniper Canyon by angling opportunistically from June through September.

Smallmouth Bass were assigned to life stages based on their total length: juvenile (< 100 mm), sub-adult (100–199 mm), and adult (≥ 200 -mm). Smallmouth Bass 325-mm and larger is a size that is the highest predatory threat to native fishes. In each reach, we estimated catch rates (number of fish captured/hour of sampling) for each pass. At our monitoring site, Little Yampa Canyon, we also estimated abundance and compared that with previous years. Annual length frequency histograms were plotted to show year class strength of Smallmouth Bass over time.

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Concurrent with Smallmouth Bass sampling, in all reaches we removed other invasive nonnative species including Northern Pike, White Sucker *Catostomus commersonii*, white sucker hybrids, centrarchids, Black Bullhead *Ameiurus melas*, Common Carp *Cyprinus carpio*, and Creek Chub *Semotilus atromaculatus* as directed by our state collecting permit. We measured lengths and released alive all native fishes, trout, and Channel Catfish *Ictalurus punctatus*. Fish community structure and composition are reported for Little Yampa Canyon and Lily Park. Northern Pike data were provided to CPW to report in the annual report for Project # 98a.

Smallmouth Bass spawning disruption (The Surge)

In 2021, we completed the 12th year of an intensive removal program (The Surge) that targeted spawning Smallmouth Bass in the Craig, South Beach, and Little Yampa Canyon reaches. These reaches have high concentrations of spawning Smallmouth Bass and are accessible by electrofishing Jon-boat. The goal of the Surge is to remove large numbers of adult bass and reduce reproductive success by capturing or displacing adult fish while they are nest building, spawning, or nest guarding. Field crews and equipment from FWS- Vernal, assisted with Surge removal sampling. During the Surge, we maximized catch rates by focusing on reaches with known spawning habitat where spawning bass were highly susceptible to electrofishing capture. Targeted spawning areas included braided river sections, backwaters, scour holes, and shallow pools below debris fans. We defined the start of spawning and Surge removal when minimum daily water temperatures remained above 16°C at the USGS Maybell Gage (09251000). Surge effort in 2021 was limited due to rapid decline of flow after temperatures reached 16°C, inhibiting our ability to safely navigate and sample with Jon-boats. Raft sampling at low base flows occurred on one pass in Little Yampa Canyon and two passes through the Craig reach.

Young-of-Year (YOY) Smallmouth Bass removal

When flows were too low to use motorized boats, we accessed the river by canoes and sampled from June 29 through October 8 with an electric seine, standard seine, or backpack electrofisher to determine Smallmouth Bass spawning success and remove small-bodied, primarily YOY, Smallmouth Bass from a 12-mile Treatment reach in Little Yampa Canyon (RM 100-112).

Results-Middle Yampa SMB removal

Water year details

The 2021 spring run-off began in late April; the peak flow was low with a short duration and declined rapidly starting in early June. Minimum daily water temperatures reached and remained above 16°C on June 5, 15 days earlier than in 2020. This date is similar to a first hatch date of June 9 predicted by a model based on temperature and flow conditions (Bestgen and Hill 2016).

Fish removal effort

In 2021, we sampled a total of 241.9 hours with boat and raft electrofishing in May and June. Most of that effort occurred at our monitoring reach, Little Yampa Canyon (96.3 hours; Table 1). Electrofishing effort in all reaches was lower in 2021. Additional sampling effort with other gear in Little Yampa Canyon included 107.3 person-hours of hook-and-line-fishing and 49.6 hours of e-seine and backpack electrofishing during nine sample passes from late June into October (Table 2). E-seine effort was higher in 2021 than in 2020, because we started 30 days earlier.

Smallmouth Bass Catch Rates- boat electrofishing

We captured 3,749 Smallmouth Bass from all eight reaches of the Yampa River with boat electrofishing. We marked 38 adults (≥ 200 mm) and 34 sub-adults (100-199 mm). We released those fish in Little Yampa Canyon of which 19 (26%) were recaptured and euthanized, leaving 53-tagged fish at large. All other Smallmouth Bass that we handled were euthanized. The number of Smallmouth Bass captured in 2021 increased from 2020 due to increased effort and the ability to sample all eight reaches.-We captured only seven large Smallmouth Bass

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≥325 mm TL and they comprised 0.2% of the total electrofishing catch. Catch rates indicate that our removal efforts are highly effective at reducing these larger bass (Breton et al. 2014). We first reported the number of piscivore-sized Smallmouth Bass in 2013 and in the first two years, they comprised 2% of the catch. The following two years they comprised 1% of the catch and since 2017; they have comprised less than 0.5% of the catch, suggesting that the proportion of larger Smallmouth Bass has declined due to their high capture probability with boat electrofishing (Breton et al 2014).

Smallmouth Bass occupied all eight reaches sampled in 2021 and catch rates reflected variable fish density in each reach and environmental conditions on any given pass. At our monitoring reach, Little Yampa Canyon, catch rates of adult bass increased slightly and sub-adult bass decreased compared to catch rates observed in 2020 (Figure 1). However, catch rates for juvenile bass increased substantially from 0.8 in 2020 to 9.1 fish/hr in 2021, indicating production of a large cohort in 2020 (Table 1). In Lily Park, while catch rates of sub-adult bass decreased, adult catch rates increased significantly (Figure 1). This may be the result of no removal passes in 2020 and only one removal pass in 2021 in Lily Park. We suggest an increased removal effort in Lily Park in 2022 to reduce potential dispersal of large adults downstream into Yampa Canyon.

Catch rates (CPUE) for Smallmouth Bass of all sizes captured by boat electrofishing were highest in Lily Park (28.7 fish/hr) followed by Lower Maybell (26.2 fish/hr) and Upper Maybell (21.1 fish/hr; Table 1; Figure 2). Abundant juvenile and adult Smallmouth Bass in those reaches (Table 1; Figure 2) drove high catch rates. Adult catch rates were highest at Lily Park (16 fish/hr) and Upper Maybell (8.6 fish/hr); otherwise, adult catch rates were 1.1—5.9 fish/hr in other reaches which is higher than adult rates in 2020. These increases are concerning and likely reflects the lack of Smallmouth Bass removal in Lily Park and reduced removal effort in other reaches in 2020. Sub-adult catch rates were highest in Craig (5.4 fish/hr) followed by Little Yampa Canyon (3.9 fish/hr) and Lower Maybell (3.5 fish/hr). Sub-adult catch rates in other reaches ranged 0.5—3.3 fish/hr which is significantly lower than in all reaches sampled in 2020 (Table 1; Figure 2). Juvenile Smallmouth Bass catch rates were highest in Lower Maybell (16.8 fish/hr) and much greater in all reaches than in 2020 (8.5 vs 0.7 fish /hr, respectively). The distribution pattern of juveniles, sub-adults, and adults, expressed as the number of fish caught per mile, is shown in Figure 3. We track year-class strength of Smallmouth Bass produced in the previous year by monitoring the number of age-1 juveniles (<100 mm) captured by boat electrofishing in early spring (Table 1; Figure 4). High catch rates of juvenile Smallmouth Bass in all reaches in 2021, provides evidence for a strong year class produced in 2020 (Figure 4).

When Smallmouth Bass spawn, electrofishing is effective because Smallmouth Bass are susceptible to electrofishing capture because they congregate in spawning areas, their behavior is to remain in those areas even if displaced, and water depths in those locations are ideal for electrofishing capture. By removing spawning fish from active spawning sites, we open that habitat to new spawners who are available for capture on subsequent passes. During the Surge, we waited 2-5 days between removal passes to allow areas to refill with new fish and then resampled each area to remove additional fish. In 2021, Surge effort in the South Beach and Little Yampa Canyon was reduced and no surge sampling occurred in Lower Juniper or Upper Maybell. Only two electrofishing boat passes were completed in Craig and one in Little Yampa Canyon during bass spawning.

Smallmouth Bass Catch Rates-electric seine, backpack electrofisher, and angling

In 2021, we sampled for 49.6 hours with an electric seine or backpack electrofisher in the 12-mile study reach of Little Yampa Canyon (RM 100-112). Catch rate for sub-adult Smallmouth Bass was high at 29.1 fish/hr (Table 2) which was about six times greater than in 2020, suggesting a strong 2020 year class. We sampled opportunistically with hook and line angling for additional removal of Smallmouth Bass from late June through

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September. Angling effort totaled 107.3 person-hours and removed 895 Smallmouth Bass for a catch rate of 7.5 fish/hr (Table 2).

Smallmouth Bass abundance

We marked 34 sub-adult and 38 adult Smallmouth Bass on our first sampling pass in Little Yampa Canyon (Table 1). Using a Lincoln-Petersen model, we estimated 667 adult Smallmouth Bass (260—1074, 95% CI; CV=31%) inhabited Little Yampa Canyon in 2021 (Table 3; Figure 5). Point estimates of adult abundance was double that in 2020. In 2021, wide confidence intervals and high coefficients of variation were a result of low catch rates during both the mark and the recapture pass. No sub-adult bass were recaptured during the recapture pass, preventing an abundance estimate for that size class. Of significance is that even with occasional strong year classes the adult population of Smallmouth Bass in Little Yampa Canyon remains low compared to prior years (Figure 5).

Fish Community Sampling

We monitored fish community structure by capturing all fish encountered by boat electrofishing on all sampling occasions in Little Yampa Canyon. Nonnative fish dominated the fish community, comprising 98% of all fish, with nonnative Smallmouth Bass and White Sucker being the most abundant species collected (Table 4). Few Northern Pike were captured in 2021 (eight fish) compared to 64 captured in 2020, but this was partly due to less effort in 2021. We captured only one Roundtail Chub (a juvenile, 75 mm TL) *Gila robusta* and no Colorado Pikeminnow in Little Yampa Canyon in 2021. Almost all (64) of the 66 Bluehead Sucker *Catostomus discobolus* in Little Yampa Canyon were recaptured fish stocked by CPW.

In Lily Park, numbers of native fish captured were similar to those in previous years (46% in 2021), but relative abundance has declined from 63% in 2017 to 45% in 2018 and 21% in 2019 (Table 5). This is primarily due to a substantial increase in the number of White Sucker and Smallmouth Bass captured in Lily Park. In 2021, White Sucker and Smallmouth Bass comprised 47% of the total fish caught. Higher relative abundance of native fish compared to 2019 may be a result of just one sampling pass through Lily Park as opposed to five in 2019. There was no sampling in Lily Park in 2020. We captured 23 Northern Pike in Lily Park in 2021, compared to 33 captured in 2019. We caught 16 Roundtail Chub of which none had previous PIT tags. Only one Colorado Pikeminnow was captured in Lily Park in 2021 and two in 2019, compared to nine in 2018. We removed 33 adult Common Carp in just one pass in 2021 compared to 24 total carp removed in five passes in 2019.

Recommendations for Middle Yampa Smallmouth Bass

- Continue using Little Yampa Canyon as a monitoring site with annual mark-recapture studies of Smallmouth Bass abundance.
- Continue intensive Smallmouth Bass nest disruption (The Surge) focusing on major production in areas in Craig, South Beach, Little Yampa Canyon, Lower Juniper, and Upper Maybell.
- Emphasize increased removal effort in Lily Park in collaboration with other agencies in order to suppress the dispersal of Smallmouth Bass into Yampa Canyon.

Acknowledgements

We thank CSU field crew, which included Trent Moore and Jed Perkins. We thank the Vernal, Utah FWS field crew (FWS-FWCO) and Jenn Logan and crew (CPW) for field assistance.

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References

- 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 submitted 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 187.
- Breton, A., D. Winkelman, J. Hawkins, and K. Bestgen. 2014. Population trends of smallmouth bass in the upper Colorado River Basin with an evaluation of removal effects. Project 161 Final Report to Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service. Larval Fish Laboratory Contribution 169.
- Hawkins, J. 2008. Evaluation of smallmouth bass and Northern Pike management in the middle Yampa River. Project 125. 2008 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J. C. Walford, and A. Hill. 2009a. Smallmouth bass control in the middle Yampa River, 2003-2007. Contribution 154 of the Larval Fish Laboratory, Colorado State University. Final Report for the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, B. Wright., J. Logan, and A. Hill. 2009b. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2009 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, and B. Wright. 2010. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2010 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, and B. Wright. 2011. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2011 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, and K. Battige. 2012. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2012 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, and K. Battige. 2013. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2013 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, and K. Battige. 2014. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2014 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.
- Hawkins, J., C. Walford, K. Battige, and C. Noble. 2015. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the

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middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2015 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.

Hawkins. J., C. Walford, and C. Noble. 2016. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2016 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Hawkins. J., C. Walford, D. Tuttle III, and T. Eyre. 2017. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2017 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Hawkins. J., C. Walford, D. Tuttle III, and T. Eyre. 2018. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2018 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Hawkins. J., C. Walford, D. Tuttle III, Kyle Dick, and T. Eyre. 2019. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2019 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Wright, B. 2009. Middle Yampa River northern pike removal and evaluation: Smallmouth Bass evaluation and limited removal. Project 98a. 2008 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.

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Table 1—Number and catch per hour (CPUE) for Smallmouth Bass captured by boat electrofishing in eight reaches of the middle Yampa River, 2021. Life stages are defined by length: juvenile (<100 mm), sub-adult (100-199 mm), and adult (≥200 mm).

Craig			EL Hrs	Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates		Juv	Sub- Adult	Adult	Total	Juv	Sub- Adult	Adult	Total
1-Surge	FWS	Jun 22-23	8.5	23	29	14	66	2.7	3.4	1.7	7.8
2-Surge	FWS	Jul 24-25	7.2	58	56	11	125	8.1	7.8	1.6	17.4
Total			16	81	85	25	191	5.2	5.4	1.6	12.2

South Beach			EL Hrs	Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates		Juv	Sub- Adult	Adult	Total	Juv	Sub- Adult	Adult	Total
1	CPW	19-May	9.9	15	6	8	29	1.5	0.6	0.8	2.9
2	CPW	26-May	5.5	0	0	0	0	0	0	0	0
3	CPW	1-June	7.7	5	3	7	15	0.7	0.4	0.9	2.0
4	CPW/LFL	June 7,10	1.5	0	0	1	1	0	0	0.7	0.7
5	LFL	16-June	2.2	7	4	14	25	3.2	1.8	6.4	11.5
Total			27	27	13	30	70	1.0	0.5	1.1	2.6

Little Yampa Canyon			EL Hrs	Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates		Juv	Sub- Adult	Adult	Total	Juv	Sub- Adult	Adult	Total
1-Mark	LFL	May 21-24	28	187	36	38	261	6.7	1.3	1.4	9.4
2-Recap	LFL	June 4-7	27.7	90	36	136	262	3.3	1.3	4.9	9.5
3	LFL	June 15-18	22.2	490	209	55	754	22.1	9.4	2.5	34.0
4	FWS	June 25-28	18.6	113	92	10	215	6.1	5.0	0.5	11.6
Total			96.3	880	373	239	1492	9.1	3.9	2.5	15.5

Lower Juniper			EL Hrs	Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates		Juv	Sub- Adult	Adult	Total	Juv	Sub- Adult	Adult	Total
1	CPW	20-May	7.6	31	19	9	59	4.1	2.5	1.2	7.8
2	CPW	27-May	9.5	81	11	13	105	8.5	1.2	1.4	11.0
3	CPW	3-June	7.9	43	4	19	66	5.4	0.5	2.4	8.3
Total			25	155	34	41	230	6.2	1.4	1.6	9.2

Table 1-continued

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Upper Maybell				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	EL Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	CPW	18-May	10.2	68	24	76	168	6.7	2.4	7.5	16.5
2	CPW	2-June	11.1	133	38	100	271	12	3.4	9.0	24.4
3	CPW	9-June	8.7	77	36	82	195	8.8	4.1	9.4	22.4
Total			30	278	98	258	634	9.3	3.3	8.6	21.1

Lower Maybell				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	EL Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	CPW	21-May	8.3	127	37	40	204	15.2	4.4	4.8	24.5
2	CPW	28-May	9.6	208	29	46	283	21.7	3.0	4.8	29.5
3	CPW	4-June	9.2	121	29	74	224	13.1	3.2	8.0	24.3
Total			27.1	456	95	160	711	16.8	3.5	5.9	26.2

Sunbeam				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	EL Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	CPW	25-May	10.5	78	18	19	115	7.4	1.7	1.8	11
Total			10.5	78	18	19	115	7.4	1.7	1.8	11

Lily Park				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	EL Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	LFL	2-June	10.7	110	26	170	306	10.3	2.4	16.0	28.7
Total			10.7	110	26	170	306	10.3	2.4	16.0	28.7

Grand Total			241.9	2065	742	942	3749	8.5	3.1	3.9	15.5
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UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Table 2—Number and catch per hour (CPUE) for Smallmouth Bass captured by e-seine and backpack electrofishing or angling in the middle Yampa River, 2021. Life stages based on length: juvenile (Juv, <100 mm), sub-adult (100-199 mm), and adult (≥200 mm).

E-Seine and backpack				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	EL Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	LFL	Jun 29-Jul 1	6.6	116	139	1	256	17.5	20.9	0.2	38.6
2	LFL	July 8-13	8.9	108	467	16	591	12.2	52.8	1.8	66.8
3	LFL	July 22-27	5.6	292	215	4	511	52	38.3	0.7	91.1
4	LFL	Aug 3-9	3.6	112	18		130	31.4	5.0		36.4
5	LFL	Aug 17-18	2.4	110	135		245	45.8	56.3		102.1
6	LFL	Aug 26-28	2.4	237	14	2	253	99.6	5.9	0.8	106.3
7	LFL	Sept 8-14	6.0	719	154	8	881	119.6	25.6	1.3	146.6
8	LFL	Sept 21-28	8.1	2177	163	4	2344	267.4	20.0	0.5	288.0
9	LFL	Oct 5-8	6.0	1653	137	2	1792	276.0	22.9	0.3	299.2
Total			49.6	5524	1442	37	7003	111.4	29.1	0.7	141.2

Angling – Little Yampa Canyon				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	LFL	June 29-30	6.75	3	51	7	61	0.4	7.6	1.0	9.0
2	LFL	July 8-10	18.32	2	81	9	92	0.1	4.4	0.5	5.0
3	LFL	July 22 - 26	25	1	282	48	331	0.0	11.3	1.9	13.2
4	LFL	17-Aug	2		5		5		2.5		2.5
5	LFL	Aug 27-28	11		34	17	51		3.1	1.5	4.6
6	LFL	Sept 8-14	26.35	1	127	78	206	0.0	4.8	3.0	7.8
7	LFL	Sept 21-28	17.9	2	35	22	59	0.1	2.0	1.2	3.3
Total			107.3	9	615	181	895	0.1	5.7	1.7	7.5

Juniper Canyon				Number of Fish				CPUE (# fish/hr)			
Pass	Agency	Dates	Hrs	Juv	Sub-Adult	Adult	Total	Juv	Sub-Adult	Adult	Total
1	LFL	12-July	12	3	59	28	90	0.3	4.9	2.3	7.5
Total			12	3	59	28	90	0.3	4.9	2.3	7.5

Grand Total			119.3	12	674	209	895	0.1	5.6	1.8	7.5
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UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Table 3—Abundance estimates for adult (≥ 200 mm) Smallmouth Bass in 24-mile-long Little Yampa Canyon, Yampa River, 2021. Abundance estimated using with a Lincoln-Petersen estimator with Chapman's correction. SE = Standard Error. CV= Coefficient of Variation.

Life Stage	Abundance	95% CI	SE	CV	Density # fish/mile
Adult	667	260—1074	207.7	31%	28

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Table 4---Number and relative abundance of fish captured by boat electrofishing in Little Yampa Canyon, Yampa River, Colorado, 2021.

LYC	Number of fish	Relative Abundance (%)
<i>nonnative species</i>		
Smallmouth Bass	1492	38.3
Northern Pike	8	0.2
White Sucker	2242	57.6
White X Flannelmouth Sucker	6	0.2
White X Bluehead Sucker	4	0.1
Creek Chub	28	0.7
Green Sunfish	18	0.5
Rainbow Trout	9	0.2
Brown Trout	7	0.2
Black Bullhead	1	0.03
Black Crappie	1	0.03
Common Carp	1	0.03
Total nonnatives	3817	97.7
<i>native species</i>		
Bluehead Sucker	66	1.4
Flannelmouth Sucker	6	0.1
Mountain Whitefish	14	0.4
Mottled Sculpin	2	0.1
Roundtail Chub	1	0.03
Total native	89	2.3
Total number of fish	3906	100%

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Table 5---Number and relative abundance of fish captured by boat electrofishing in Lily Park, Yampa River, Colorado 2021.

LP	Number of fish	Relative Abundance (%)
<i>nonnative species</i>		
Smallmouth Bass	306	26.7
Northern Pike	23	2.0
White Sucker	234	20.4
White X Flannelmouth Sucker	2	0.2
Brown Trout	2	0.2
Channel Catfish	20	1.7
Common Carp	33	2.9
Total nonnative	620	54.1
<i>native species</i>		
Bluehead Sucker	59	5.1
Flannelmouth Sucker	450	39.2
Mountain Whitefish	1	0.1
Roundtail Chub	16	1.4
Colorado Pikeminnow	1	0.1
Total native	527	45.9
Total number	1147	100%

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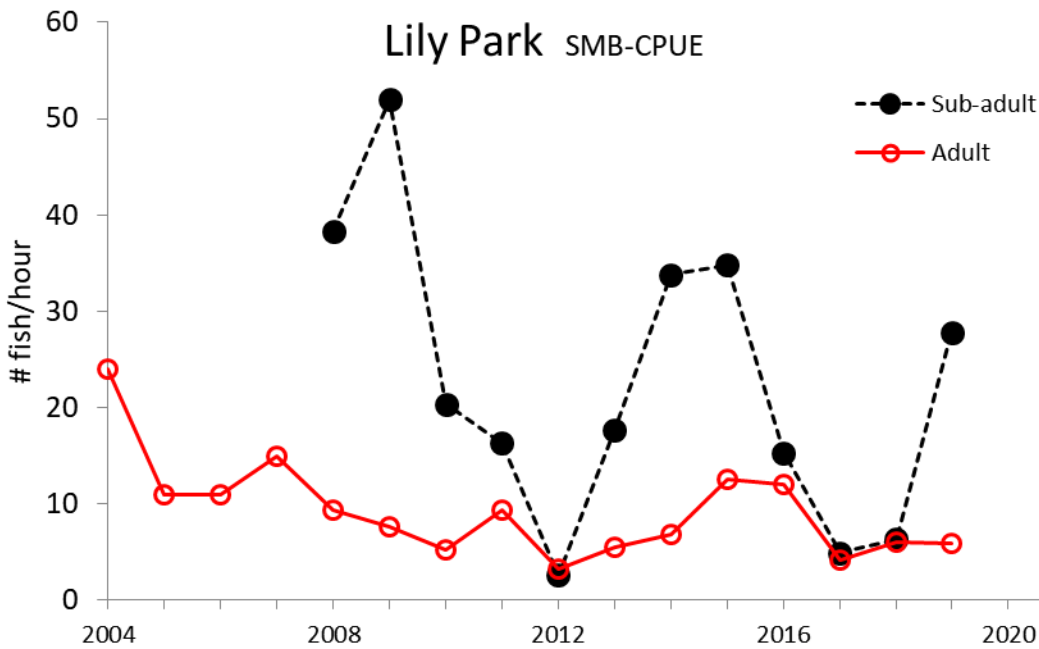
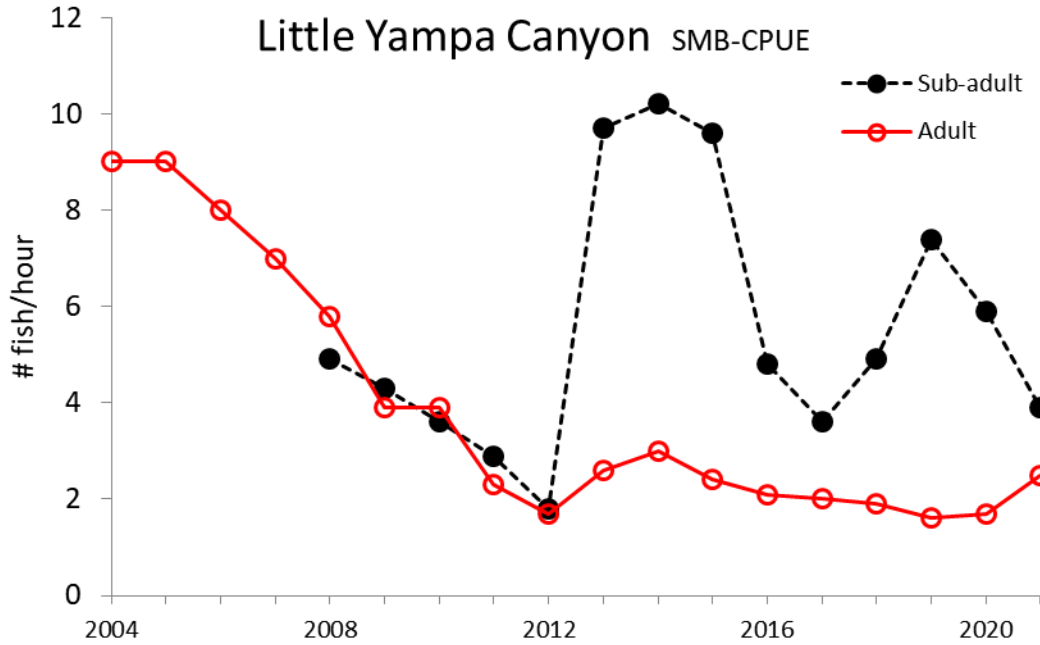


Figure 1—Number of sub-adult (100-199 mm) and adult (≥ 200 mm) Smallmouth Bass captured per hour of boat electrofishing in two reaches of the Yampa River, 2004-2021.

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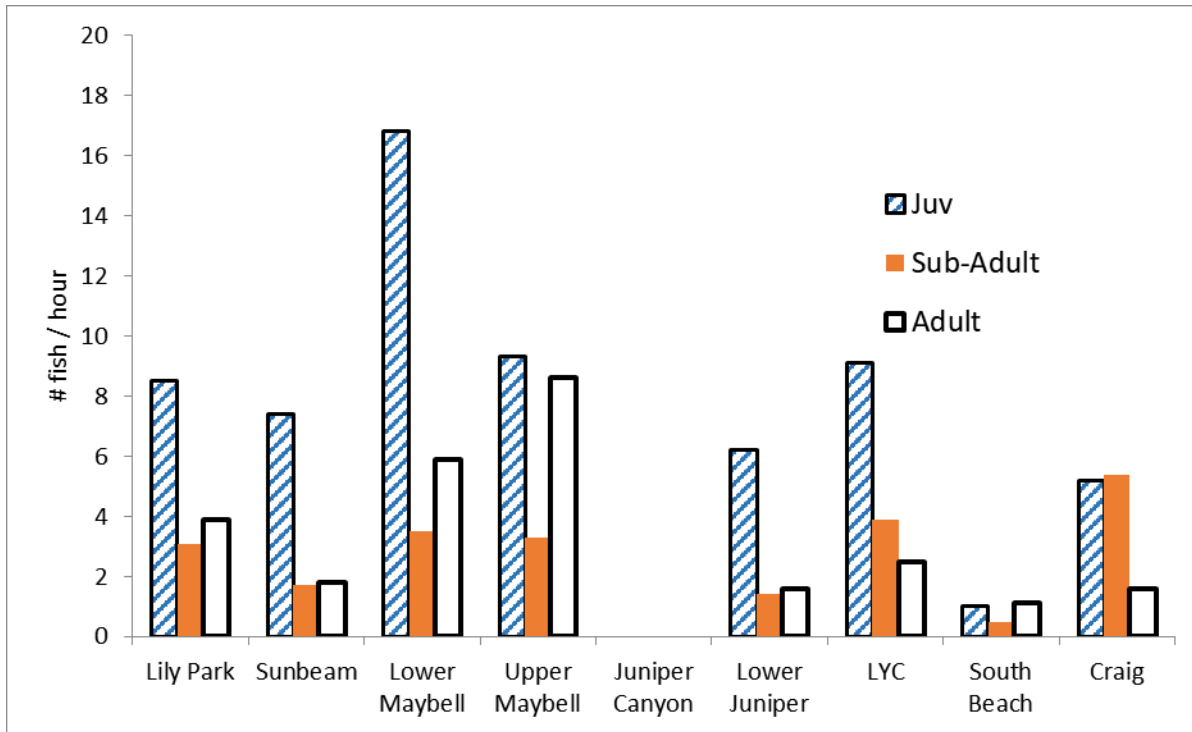


Figure 2—Catch per unit effort for Smallmouth Bass captured by boat electrofishing in study reaches arranged longitudinally from downstream (left) to upstream (right) in the Yampa River, 2021.

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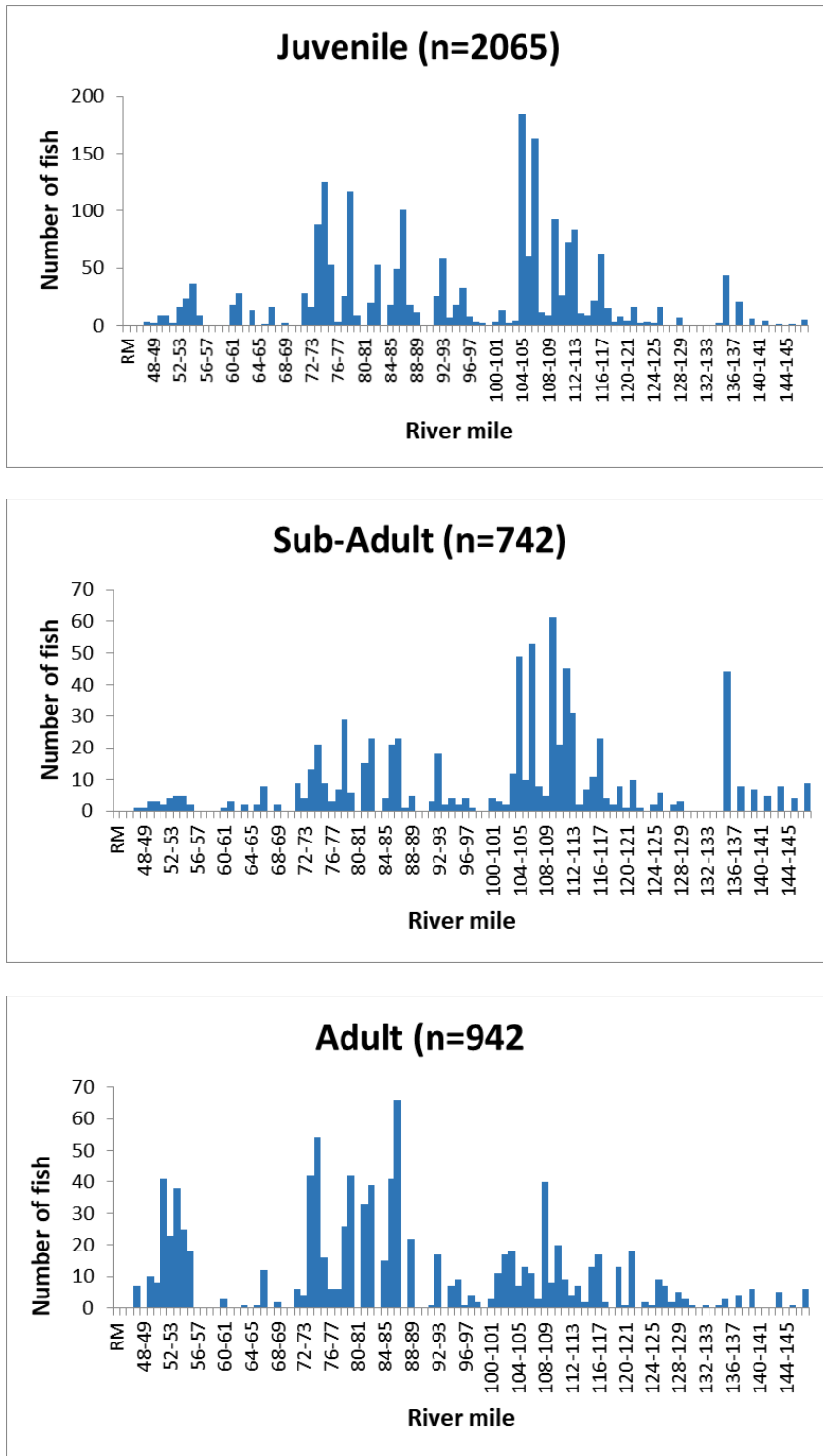


Figure 3—Number of Smallmouth Bass captured with boat electrofishing per mile in the middle Yampa River, 2021. Note that the y-axis scale varies by life stage.

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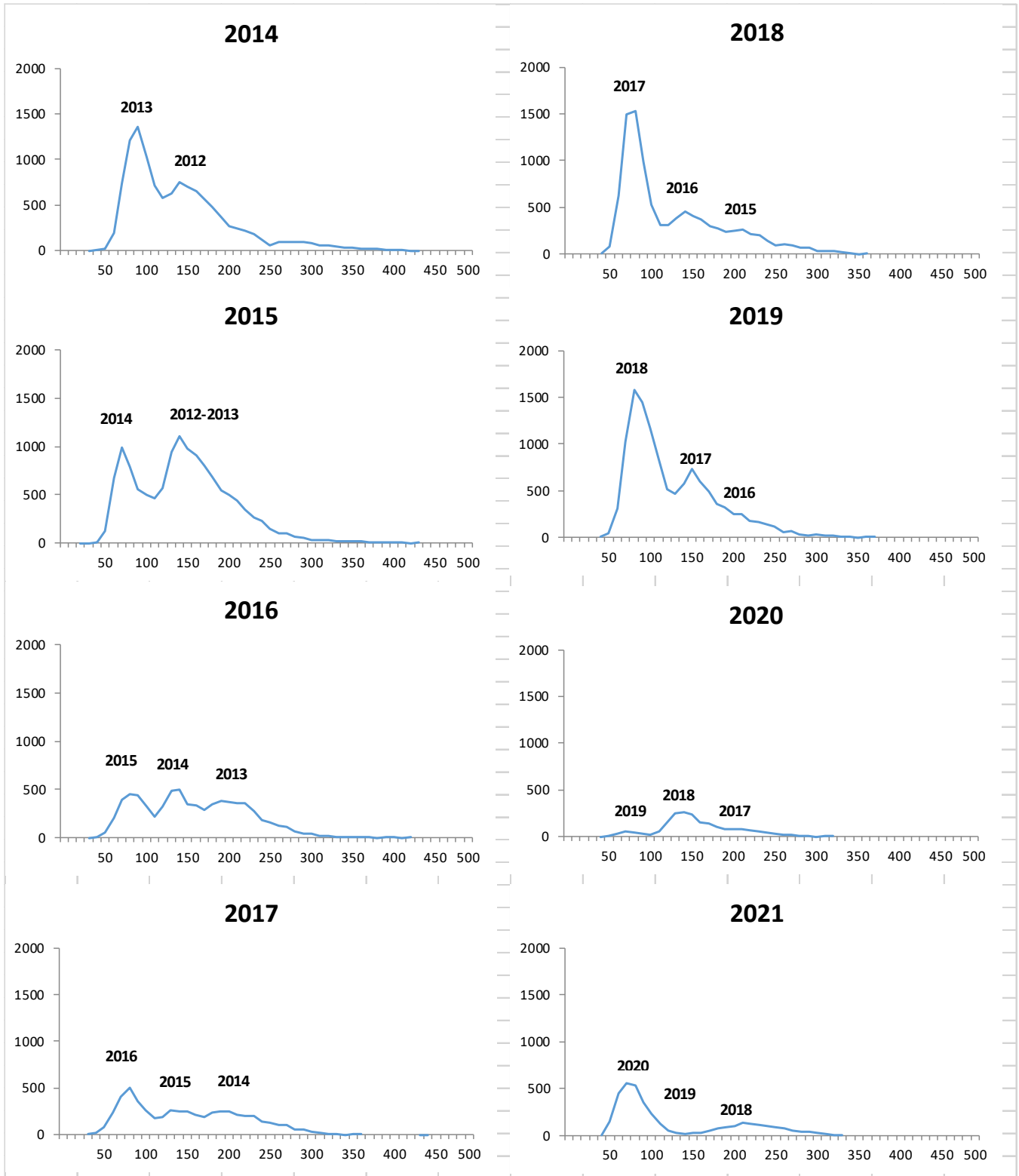


Figure 4—Annual length-frequency of Smallmouth Bass captured with boat electrofishing in all reaches of the middle Yampa River, 2014-2021 Estimated year classes in each graph show year-class strength for the prior three years.

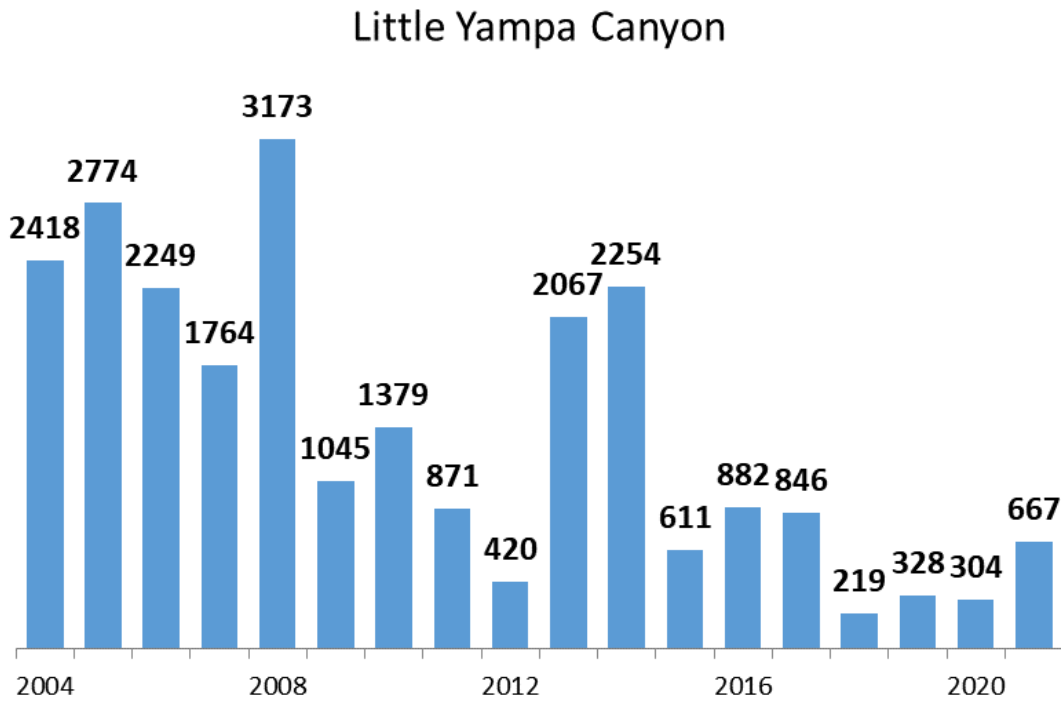


Figure 5---Estimated abundance of adult Smallmouth Bass (≥ 200 mm) in Little Yampa Canyon, Yampa River, 2004—2021. Abundance estimated with a modified Lincoln-Peterson estimator.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

COLORADO RIVER RECOVERY PROGRAM
FY 2021 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 125

Preliminary results of the removal of Northern Pike from the upper Yampa River, 2021.
Hawkins, John, Donald Tuttle III, and Kyle Dick.

Introduction

Northern Pike, *Esox lucius*, are a nonnative species introduced to the Yampa River in the 1970s (Hawkins et al. 2005). They reproduce primarily in the river reaches upstream of Craig, Colorado, and in several reservoirs in the basin. They are considered a threat to native fishes, endangered fishes, as well as trout and Mountain Whitefish, *Prosopium williamsoni*. To address this threat, Northern Pike are being physically removed from the Yampa River and some reservoirs by several state or federal agencies to benefit endangered fishes. This study describes annual results of Northern Pike removal from Tree Haus Bridge at river mile (RM 194.1) in Steamboat Springs, Colorado to Hayden Pump Station boat ramp (RM 170.6). River miles were measured as the distance upstream from the Green River confluence. Land along the Yampa River within the study site is primarily private property and although electrofishing can occur in the river without touching the river bottom or banks, gaining access to launch or take-out boats, set nets, or stop and process fish requires landowner permission. In 2021 and previous years, permission was granted by a large majority of landowners. Our goals were to evaluate Northern Pike removal, describe their abundance, density, distribution, and spawning phenology and identify and rank spawning sites to assist future management.

Methods

We sampled backwaters and sloughs between KOA campground (RM 189.3) and Hayden Pump Station boat ramp (RM 170.6) after ice-off in the spring with raft electrofishing. We did not raft electrofish the section through downtown Steamboat Springs between Tree Haus Bridge and KOA due to a lack of backwaters in the reach and concern for safely rafting under several low bridges; however, we did sample Tree Haus Bridge backwater. Backwaters attract and concentrate pike for feeding, resting, conditioning, and spawning. We focused our effort on backwaters where Northern Pike concentrate and are highly vulnerable to capture and we minimized our effort in the main channel where trout and Mountain Whitefish are abundant and Northern Pike are dispersed and difficult to capture. On each sample occasion, we ranked each backwater as high, medium, low, or no spawning potential, based on connectivity to the river, suitable depth, negligible water velocity, and presence of submerged aquatic or terrestrial vegetation.

We sampled backwaters with raft electrofishing and blocked the mouth of larger backwaters with a fine-mesh gill net to prevent fish escapement while electrofishing. During each sampling occasion all Northern pike were euthanized with an overdose of the FDA approved, fish anesthetic, Finquel MS-222 (Methanesulfonate). If a salmonid was captured, it was either immediately released away from the boat or placed in a tub of fresh water and released after we completed sampling that backwater. If a captured trout or Mountain Whitefish appeared in physiological distress, we revived it with pure oxygen from a compressed oxygen bottle that was diffused through an air stone. We also added solar salt to the holding water to improve their osmoregulatory efficiency and aid in recovery.

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In mid-June, after pike spawning ended, we sampled for YOY Northern Pike with seines to collect YOY Northern Pike to confirm spawning success and for otolith ageing to estimate hatch dates.

Results

In 2021, ice-off at the “Yampa River at Steamboat Springs, CO”, USGS Gage 09239500 occurred on March 05, 19 days earlier than in 2019. Raft electrofishing occurred on three occasions between May 4 and May 20 during flows that ranged from 341-1,400 cfs, measured at the Steamboat Gage. We sampled 61 individual backwaters on one to three occasions with raft electrofishing for 18.4 hours and gill nets for 202.8 hours. We observed, but seldom netted, non-target species including Brown Trout, Rainbow Trout, Mountain Whitefish, Mottled Sculpin, and White Sucker.

We captured 145 Northern Pike, including 52 with raft electrofishing and gill nets during pike spawning and 93 with seines after the spawning event (Table 1). Mean length of pike captured during spawning was 597 mm and length ranged from 392 to 860 mm (Figure 1). As in past years, most (92%) of the 52 pike captured were large piscivores ≥ 450 mm, a size considered the greatest threat as predators. We determined sex of all pike by either expression of gametes or dissection and internal examination of gamete development. Of the 52 Northern Pike captured during spawning sampling, 24 were females, 28 were males. Catch rate was highest on the first pass at 4.1 pike/hour. Catch rates on other passes ranged 1.1—1.8 pike/hour (Table 1).

Ripe male Northern Pike were captured on every Pass from May 4 through May 20. Males often express gametes more easily than females and males can be ripe several weeks before and after spawning. Females are therefore a better indicator of spawning dates because they are ripe for fewer days before and after spawning than males. Ripe or spent females were captured on all three passes as well (Table 3).

We identified spawning locations by river mile and UTM coordinates and described their attributes related to spawning on each pass. We suggest that biologists removing Northern Pike in other reaches of the Yampa River identify spawning locations in their reaches, rank those locations for spawning potential and suggest potential remediation options. These reach and site-specific plans could be prioritized for the entire basin to inform future capital projects and actions by agency managers, assist biologists with mitigation suggestions as they review 404 permits, or inform those doing trout habitat enhancement.

We were effective catching YOY Northern Pike using seines, which were more effective than backpack electrofishers, especially in backwaters with heavy vegetation, which reduced the ability of fish to swim toward the electrical current and be captured (Table 1). We have aged 50 YOY Northern Pike from 2019, 48 from 2018, 35 from 2017, 51 from 2016 and 49 from 2011. We plan to age at least 50 YOY collected from Steamboat in 2021 to compare among year differences in the timing and duration of reproduction.

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Recommendations for Upper Yampa River Northern pike

- Continue to focus Northern Pike removal in backwaters using raft electrofishing.
- Collect physical habitat characteristics for spawning areas.
- Develop a management plan that ranks spawning habitat and possible mitigation measures to reduce access or availability.

Acknowledgements

We thank the CSU field crew that assisted with field sampling including Trent Moore and Jed Perkins. We thank Billy Atkinson (CPW) and the many Yampa Valley landowners who graciously allowed access on their property during sampling. We thank Kevin McAbee for reviewing this report.

References

Finney, S. and B. Atkinson. 2004. Upper Yampa River northern pike tagging. Annual Report to the Colorado River Endangered Fish Recovery Program. U.S, Fish and Wildlife Service.

Finney, S. and B. Atkinson. 2005. Upper Yampa River northern pike tagging. Annual Report to the Colorado River Endangered Fish Recovery Program. U.S, Fish and Wildlife Service.

Hawkins, J. and D. Tuttle, III. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Appendix B: Preliminary results of the removal of Northern Pike from the upper Yampa River, 2017. Project 125/98c. 2017 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Hawkins, J., D. Tuttle, III, and K. Dick. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Appendix B: Preliminary results of the removal of Northern Pike from the upper Yampa River, 2018. Project 125/98c. 2018 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

Hawkins, J. A., C. Walford, and T. Sorenson. 2005. Northern pike management studies in the Yampa River, Colorado, 1992-2002. Final Report for the Upper Colorado River Endangered Fish Recovery Program, Project No. 98a. Lakewood, CO. Larval Fish Laboratory Contribution 137.

Hawkins, J., C. Walford, and K. Battige. 2014. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2014. Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.

Hawkins, J., C. Walford, K. Battige, and C. Noble. 2015. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. Project 125. 2015. Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.

Hawkins, J., C. Walford, and C. Noble. 2016. Evaluation of smallmouth bass and northern pike management in the middle Yampa River: Preliminary results of the removal of smallmouth bass from the middle Yampa River and Northern Pike from the upper Yampa River. Project 125. 2016 Annual Report to the Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service

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Table 1—Number and catch rate per hour (CPUE) of Northern Pike captured in the Yampa River between Steamboat Springs and Hayden, Colorado, 2021. Life stages based on total length: juvenile (Juv.; <300 mm) and adult (≥300 mm).

Sampling for adults				Number of fish			CPUE (# fish/hr)		
Pass	Sampling Dates	Sampling Gear	Effort (Hrs)	Juv.	Adult	All sizes	Juv.	Adult	All sizes
1	May 4-7	Raft EL	6.1	--	18	18	--	4.1	4.1
		GN	40.8	--	5	5	--	0.1	0.1
2	May 11-13	Raft EL	6.0	--	11	11	--	1.8	1.8
		GN	89.0	--	8	8	--	0.1	0.1
3	May 18-20	Raft EL	7.9	--	9	9	--	1.1	1.1
		Gill net	73.0	--	1	1	--	0.01	0.01
Totals		Raft EL	18.4	--	38	38	--	2.7	2.7
		Gill net	202.8	--	14	14	--		
		Total fish		--	52	52			

Sampling for Young-of-year				Number of fish		
Sampling Date	Sampling Gear	Effort	Juv.	Adult	All sizes	
June 14	Seine	4 seine hauls	93	--	93	
Total fish			93	--	93	

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Table 2—Percent of Northern Pike in spawning condition (ripe or spent) and water temperature and discharge during each sample occasion (Pass) in the Yampa River, 2021. Temperature and discharge records from the Yampa River USGS gage 09239500.

	Pass 1 May 4-7	Pass 2 May 10-13	Pass 3 May 17-20
% ripe males	86%	90%	100%
# males captured	14	10	4
% ripe or spent females	44%	38%	100%
# females captured	9	8	2
Min and Max water temperature	4.4—12.5°C	3.8—12.4°C	4.9—11.2°C
Min and Max daily discharge	341—607 cfs	408—716 cfs	995—1400 cfs

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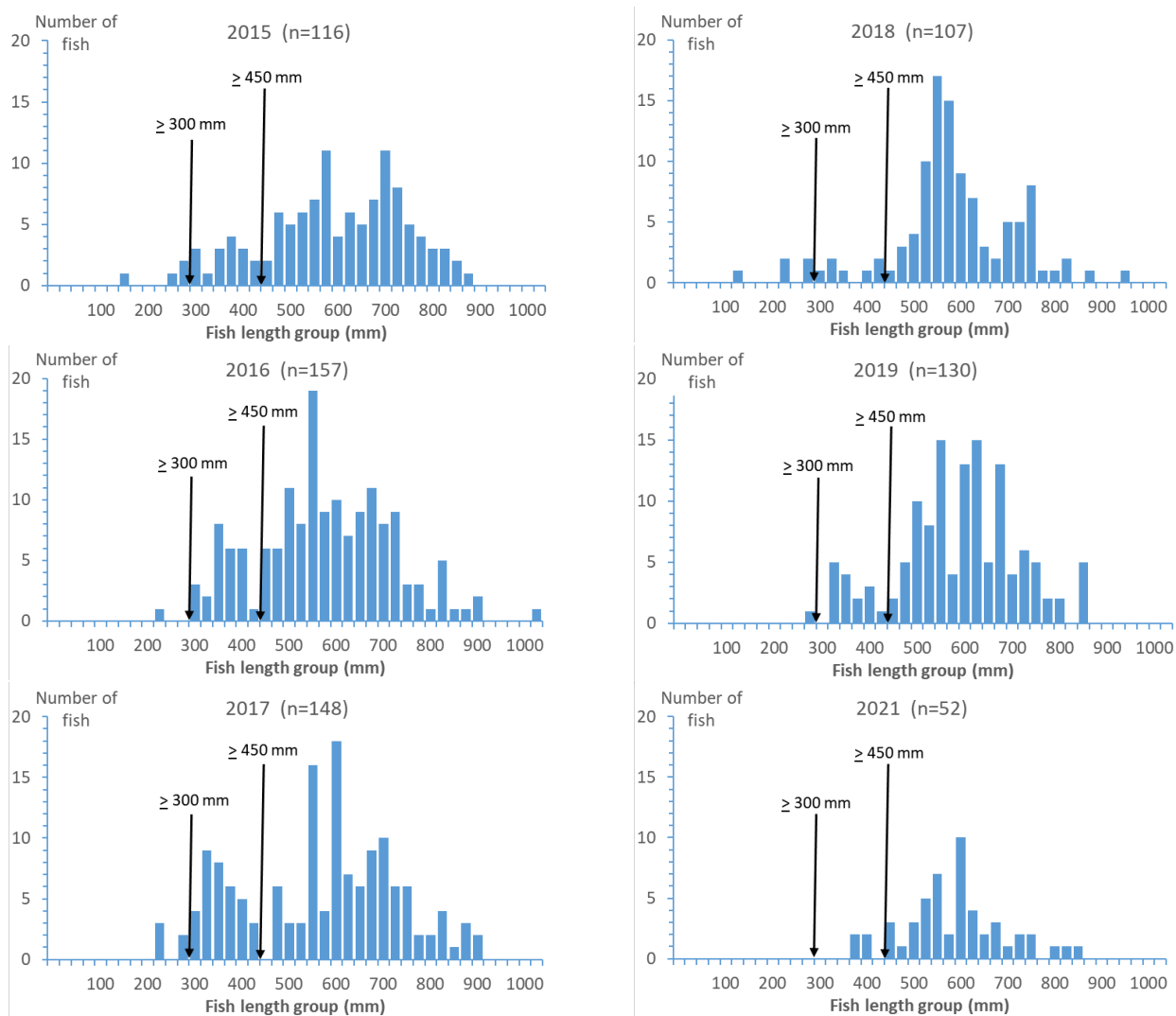


Figure 1—Length frequency of Northern Pike captured in the upper Yampa River, 2015-2021. Vertical arrows indicate the minimum length of adult fish (≥ 300 mm total length; TL) and piscivores (≥ 450 mm TL). Length-group increments are 25 mm.

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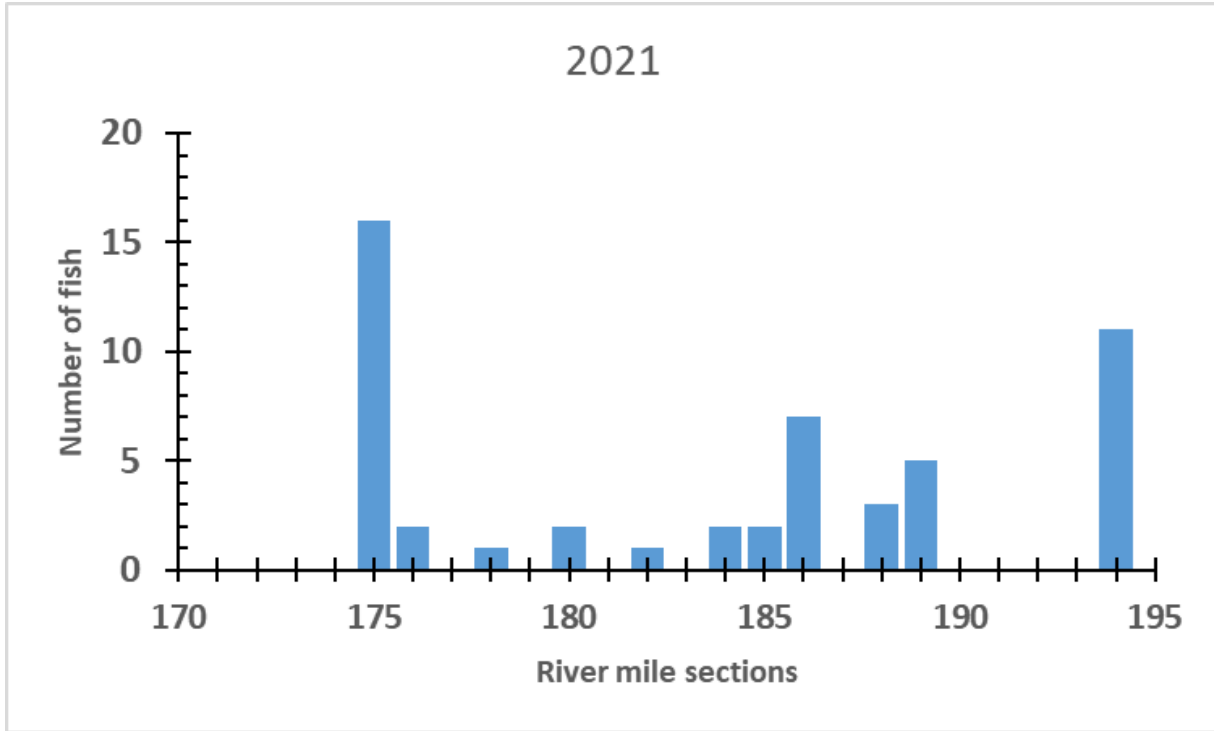


Figure 2—Distribution of 52 adult Northern Pike (≥ 300 mm) captured by raft electrofishing and gillnet in the upper Yampa River, 2021.

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: 125

Project Title:

Evaluation of Smallmouth Bass and Northern Pike Management in the Middle Yampa River (Surge)

Principal Investigator:

Travis Francis, Deputy Project Leader
U.S. Fish and Wildlife Service
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Grand Junction, Colorado 81501
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Fax (970) 628-7217
Email: travis_francis@fws.gov

Project/Grant Period:

Start date: 10/01/2020

End date: 09/30/2024

Reporting period end date: 09/30/2021

Is this the final report? Yes _____ No X

Performance:

We were tasked with providing a 3-person field crew for eight days (total of 24 man-days) with administrative support to assist crews from the CSU – Larval Fish Laboratory sometime from mid-June to mid-July. The 2021 smallmouth bass “Surge” effort was targeted to remove smallmouth bass as the Yampa River neared base flows. Due to less than average snowpack and temporally reduced spring flows our contribution to the Surge in FY21 was not possible due to unsafe river conditions. With the Upper Colorado River Endangered Fish Recovery Programs approval, we have decided to utilize the funding from FY21 for our efforts assisting with the Surge in FY22.

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: 125

Principal Investigator:

Christian Smith, Principal Investigator
U.S. Fish and Wildlife Service
Vernal FWCO
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Vernal, Utah 84078
Phone: (435) 789-0351 X 21
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Project Title:

Evaluation of Smallmouth Bass and Northern Pike management in the middle Yampa River.

Bureau of Reclamation Agreement Number:

R20PG00024

Project/Grant Period:

Start date: 10/01/2019

End date: 09/30/2024

Reporting period end date: 09/30/2021

Is this the final report? Yes _____ No X

Performance:

U.S. Fish and Wildlife Service Green River Basin FWCO completed two Surge passes on the Yampa River between Elkhead and South Beach (RM 148 – 134.5). The first electrofishing pass was completed June 22- June 23, 2021. The second electrofishing pass was completed June 24- June 25, 2021. USFWS GRBFWCO also completed a single surge electrofishing pass from Milk Creek to Morgan Gulch (RM 118.5 – RM 103.2). All data were submitted to the CSU Larval Fish Lab, who will compile, analyze, and report the results.

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: 125/98c

Project Title: Evaluation of Smallmouth Bass and Northern Pike management in the middle Yampa River.

Principal Investigator:

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Larval Fish Laboratory
Dept. of Fish, Wildlife, and Conservation Biology
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Bureau of Reclamation Agreement Number:
R19AP00058

Project/Grant Period:

Start date: 10/01/2018
End date: 09/30/2023
Reporting period end date: 09/30/2021
Is this the final report? Yes _____ No X

Performance:

We conducted one marking pass followed by three removal passes in Little Yampa Canyon and one removal pass in Lily Park, and assisted Colorado Parks and Wildlife with two removal passes in South Beach. We obtained an estimate of the number of Smallmouth Bass in Little Yampa Canyon. We coordinated Surge sampling with USFWS. Invasive nonnative predators were removed from Critical Habitat on multiple occasions from late May into October.

We captured and removed adult and Young-of-Year pike from backwaters on the Yampa River between Steamboat Springs and Hayden, Colorado to confirm spawning locations and timing. We produced an annual report on activities in 2021 and will present data at meetings in 2022.