

I. Project Title: Upper Yampa River northern pike management and monitoring

II. Bureau of Reclamation Agreement Number(s): R15PG00083

Project/Grant Period: Start date: 10/01/2014
End date: 09/30/2019
Reporting period end date: 9/30/2019
Is this the final report? Yes _____ No X

III. Principal Investigators:
Christian Smith
U. S. Fish and Wildlife Service
1380 South 2350 West
Vernal, UT 84078
(435) 789-0351; christian_t_smith@fws.gov

IV. Abstract:
This project aims to reduce the abundance of nonnative fishes immediately upstream of endangered fish critical habitat in the Yampa River between Hayden and Craig, Colorado. Electrofishing boats are used to sample this reach during spring and early summer. In 2019 we euthanized 3 smallmouth bass, 2,242 white suckers, and 197 northern pike. All northern pike captured on the first pass were marked so that abundance of the species within this study reach can be estimated and compared to estimates from 2004-2010. More northern pike were removed in 2019 than 2018 (N=171). The number of northern pike removed annually in this project have declined markedly since Colorado Parks and Wildlife (CPW) began using gill nets to remove northern pike from the Yampa River in 2014. However, northern pike, white sucker, and smallmouth bass remain in this system, and boat electrofishing allows researchers to monitor and control these species throughout this reach.

V. Study Schedule: 2004-ongoing.

VI. Relationship to RIPRAP:
GREEN RIVER ACTION PLAN: YAMPA AND LITTLE SNAKE RIVERS
III.B.2 Control nonnative fishes via mechanical removal
III.B.2.a. Estimate nonnative status, trends, and distribution
III.B.2.d. Remove northern pike from Yampa River
III.B.2.e. Remove smallmouth bass

VII. Accomplishment of FY 2019 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A total of six electrofishing passes were conducted within the 38-mile study reach of the

upper Yampa River in 2019. All northern pike (NP) caught during the first pass (N=84) were marked with Floy and PIT tags. This marking pass was conducted so that NP abundance could be estimated within the Project 98b study reach and compared to abundance estimates from 2004-2010 (Zelasko et al. 2015). The goal of this exercise is to determine whether the efficacy of newer removal methods such as gill netting, which has been supported by declining NP catch rates in the reach, is evident in mark-recapture metrics as well. The results of the abundance estimate are not yet available but will be provided in a separate report in the future. Beyond the northern pike marked during pass one, all effort was directed at nonnative fish removal, and all northern pike, smallmouth bass, and white sucker captured were euthanized. Including the marking pass, six full passes from the Hayden Pump Station boat ramp (RM 171.6) to the South Beach boat ramp (RM 134.5) were conducted between 8 April and 31 May 2019. An additional three passes occurred in conjunction with “The Surge”, which is a component of Project 125 (Colorado State University Larval Fish Lab [LFL]), wherein multiple agencies simultaneously conduct smallmouth bass removal throughout the Yampa River downstream of Hayden, Colorado. Surge removal efforts occurred from the Dorsey boat ramp (RM 151.5) to South Beach (RM 134.5). Smallmouth bass captured during Surge passes are reported in the Project 125 Annual Report (Hawkins 2019, in prep.), however northern pike and white sucker are reported herein.

Northern Pike: Project 98b

We removed 197 northern pike from the study reach during Project 98b passes in 2019. We consider fish <300mm total length (TL) juveniles, fish \geq 300mm TL adults, and fish \geq 450mm TL as piscivores. Of the 197 fish removed in 2019, 6 were juveniles and 191 were adults, of which 118 were piscivores (Table 1).

Length-frequency of pike captured in 2019 in Project 98b showed greater representation by medium to large-sized adults than other size classes (Figure 1). The majority (95.5%) of fish captured were adults, ranging from 302-980 mm. A similar pattern was observed last year, although the 2018 size distribution displayed slightly smaller adults which could be explained as growth when compared to 2019 (Figure 2).

More northern pike were removed as part of Project 98b than in 2018, when 132 individuals (10 juveniles and 122 adults, of which 78 were piscivores) were euthanized (Figure 3; Smith 2018). The increase in numbers likely resulted from increased effort wherein two more removal passes were conducted in 2019 than in 2018 because GRB FWCO crews were not understaffed nor obligated to complete Project 128 work during the same timeframe this year.

Overall catch rates were similar to 2018 and the highest of any year since 2013 (Figure-4). Unlike past years when catch rates typically peaked during the first pass, catch rates in Project 98b were highest during the second pass (17 – 19 April, CPUE = 5.1 NP/hr; Figure 5) in 2019. However, it should be mentioned that the entire reach, including main channel habitat, was sampled during the marking pass (Pass 1) to ensure consistency with previous abundance estimates and possibly increase the number of marked fish within the reach. This comprehensive removal strategy was employed by GRB FWCO prior to 2016 but abandoned in favor of a backwater-focused strategy in recent years in response

to declining main channel catch rates. More specifically, in 2016 crews began electrofishing almost exclusively in backwaters and recording effort and capture locations therein. While this biased overall catch rates high in comparison to those prior to 2016, removal efficiency was increased. Additionally, data collected after 2015 provides more resolution and the ability to identify the discrete location and relative amplitude of NP captures (Figure heat map).

Northern Pike: The Surge

In contrast to Project 98b, effort during The Surge is focused on main channel shoreline habitat. Furthermore, Surge passes are typically conducted during mid-summer whereas Project 98b efforts primarily occur during spring. As such, except for overall annual catch rates (Figure 4), the analysis and metrics reported herein differentiate between the two projects. A total of 151 northern pike were removed during Surge passes in 2019. Of these, 118 were juveniles and two were piscivores. The majority (90.7% or 121 out of 133 total) of juvenile pike captures in the study reach this year occurred during The Surge (Table 1; Figure 1).

Northern pike catch rates during The Surge peaked in the second Surge pass (Figure 5). Catch rates were driven by juvenile pike captures (N=121), which increased markedly from 2018 (N=33). Higher juvenile northern pike catch rates and numbers, which were reported by CSU LFL in other reaches in 2019 as well (Hawkins 2019 in prep), suggest a successful NP spawn in the Yampa River in 2019.

Northern Pike Tags

A total of 84 northern pike were marked with Floy tags during pass one (8-11 April). Subsequent removal efforts yielded 12 of these marked fish. An additional four pike were caught that were carrying purple Floy tags that were inserted by CSU LFL in April in the upstream Project 98c reach.

Smallmouth Bass

Three smallmouth bass (156 – 330 mm TL) were caught during Project 98b passes in 2019 compared to 15 smallmouth bass (180 – 373 mm TL; 2 juveniles < 200 mm, 13 adults ≥ 200 mm) in 2018 (Figure 6; Smith & Jones 2018).

White Sucker

We removed 2,442 white sucker (20-558 mm TL) in 2019 compared to 1,210 white sucker (32 -525 mm TL) in 2018. The majority of these fish (76.7% or 1,873 individuals) were removed during Project 98b. Additionally, two white sucker x bluehead sucker and 11 white sucker x flannelmouth sucker were removed between projects. Pass six yielded the most white sucker captures (Figure 8) and highest white sucker catch rates (Figure 9). Similar to the past six years (Webber 2012, 2013; Webber et al. 2014; Smith 2018; Smith and Jones 2015, 2016, 2017), depletion between passes did not occur in Project 98b this year (Figure 9). We continue to observe sustained white sucker abundance in this reach every year and are aware of their direct (competition and hybridization) and indirect (prey base for northern pike) threats to native fish in the

Yampa River. Additionally, marked increases in white sucker hybrid captures were reported from Yampa Canyon in 2018 (Jones and Smith 2018), further validating the importance of the continued removal of this species in the Yampa River.

Shortcomings

Concerns regarding future access to the “151” backwater, particularly for gill netting efforts, prompted us to not conduct removal in this backwater in 2019 because of the landowner’s distaste for electrofishing. Given the decline in the number of pike captured and catch rates that we have observed while electrofishing this backwater in recent years, especially when compared to the higher catch rates produced by gill netting, we felt it was better left alone.

VIII. Additional noteworthy observations:

- One flannelmouth sucker was caught on the Yampa River between Hayden and Craig, Colorado in 2019. This fish was not marked with a PIT tag prior to capture and unfortunately was not tagged during this event.
- During peak flows in late June, the Yampa River near the Yampa Valley Golf Course broke through its bank, flooded multiple gravel pits, and abandoned approximately one mile of the previous river channel. It is not known whether any northern pike occupied these gravel pits prior to this gravel pit capture. However, the lentic nature of these ponds will likely provide northern pike spawning habitat in the future as will the abandoned river channel provide smallmouth bass spawning habitat unless the river is reconfigured to its former state.

IX. Recommendations:

- Encourage the responsible parties to rebuild the river bank at the site of the gravel pit capture before ice off occurs in 2020 so that any newly available northern pike and smallmouth bass spawning habitat created by this incident will not be connected to the Yampa River during the 2020 spawning seasons.
- We recommend conducting 5 passes as early as possible in the spring to remove as many northern pike as possible in backwaters where spawning individuals are concentrated. Two passes were eliminated from this project due to budget reductions in 2020. Since only three smallmouth bass were caught in Project 98b this year and bass removal in this reach occurs during The Surge, prioritization should be placed on removing northern pike in the early season.
- If deemed necessary, gill netting efforts could be extended later into the spring and into more backwaters by shifting some effort from electrofishing to gill netting. In some cases this will require us to obtain permission from landowners to access backwaters that exist within private property. Crews in electrofishing boats could identify near and off-channel backwaters that are not accessible to jon boats due to constrictions or breach depths at certain flows. We believe that this would increase our efficiency at low and high water levels.

X. Project Status: This project is on track and ongoing

- XI. FY 2019 Budget Status:
- A. Funds Provided: \$99,823
 - B. Funds Expended: \$99,823
 - C. Difference: -0-
 - D. Percent of the FY 2019 work completed: 100%
 - E. Recovery Program funds spent for publication charges: -0-

XII. Status of Data Submission: Data will be submitted to the STReAMS database in December 2019.

XIII. Signed:

<u>Christian Smith</u>	<u>20 November 2019</u>
Principal Investigator	Date

References:

- Jones, M.T. and C. Smith. 2018. Smallmouth bass control in the lower Yampa River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.
- Smith, C. 2018. Upper Yampa River northern pike management and monitoring. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO
- Smith, C. and M.T. Jones. 2015. Upper Yampa River northern pike management and monitoring. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO
- Smith, C. and M.T. Jones. 2016. Upper Yampa River northern pike management and monitoring. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO
- Smith, C. and M.T. Jones. 2017. Upper Yampa River northern pike management and monitoring. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO
- Webber, A. 2012. Management of northern pike from the Yampa River upstream of Craig, Colorado. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.
- Webber, A. 2013. Management of northern pike from the Yampa River upstream of Craig, Colorado. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.
- Webber, A., C. Smith, and M.T. Jones. 2014. Upper Yampa River northern pike management and monitoring. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.
- Zelasko, K.A., K.R. Bestgen, J.A. Hawkins, and G.C. White. Abundance and population dynamics of invasive northern pike *Esox lucius*, Yampa River, Colorado, 2004-2010.

Final Report to the Upper Colorado River Endangered Fish Recovery Program, Project 161b, Denver, CO. Larval Fish Laboratory Contribution 185.

Table 1. Juvenile (includes all northern pike < 300 mm), adult (300 ≤ 449 mm), and piscivore (≤450 mm) class northern pike captured in the Yampa River for each pass in 2019. Dates sampled are indicated for each pass, with passes 1 through 6 being complete passes wherein all 38 miles of the study reach were sampled. Surge passes were conducted in conjunction with Project 125 and occurred from the Dorsey boat ramp (RM 151.5) to South Beach (RM 134.5).

Pass/Date	Juveniles	Adults	Piscivores	Total
1 - 8-11 April *	6	20	58	84
2 - 17-19 April	2	23	41	66
3 - 22-24 April	2	19	34	55
4 - 25, 29 & 30 April, 1 May	1	13	16	30
5 - 1-3 May	0	9	9	18
6 - 29-31 May	1	10	17	28
Surge 1 - 23-24 July	42	3	2	47
Surge 2 - 25-26 July	28	5	8	41
Surge 3 - 29 & 31 July	30	4	4	38
Surge 4 - 1-2 August	18	1	6	25
Total	130	107	195	432

* Pass one was a marking pass wherein all northern pike captured were released. Subsequent passes involved northern pike removal only.

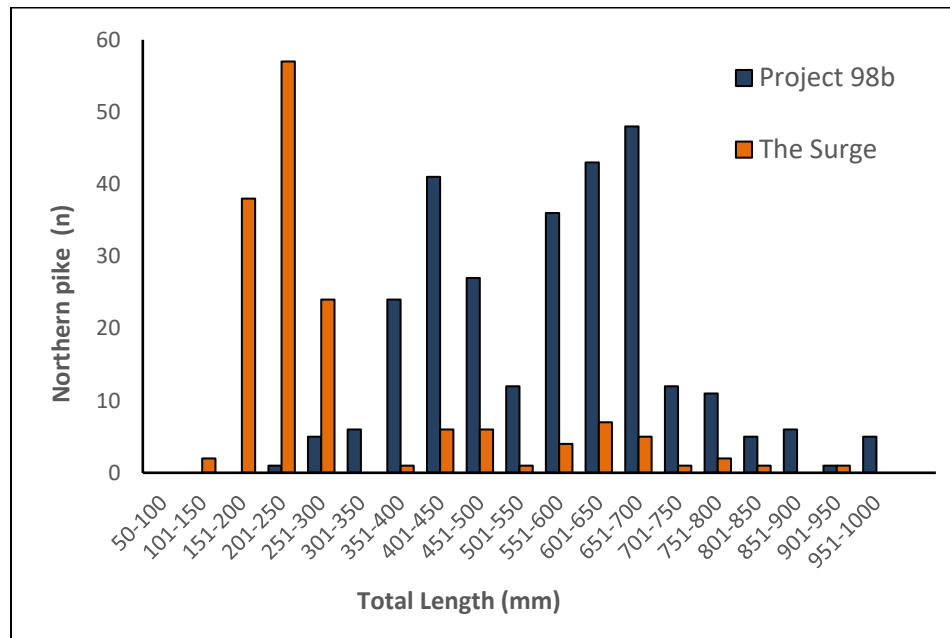


Figure 1. Length frequency of northern pike captured in Project 98b (blue bars) and The Surge/Project 125 (orange bars), 2019. Project 98b passes occurred from 8 April to 31 May and Surge passes were conducted from 23 July to 2 August.

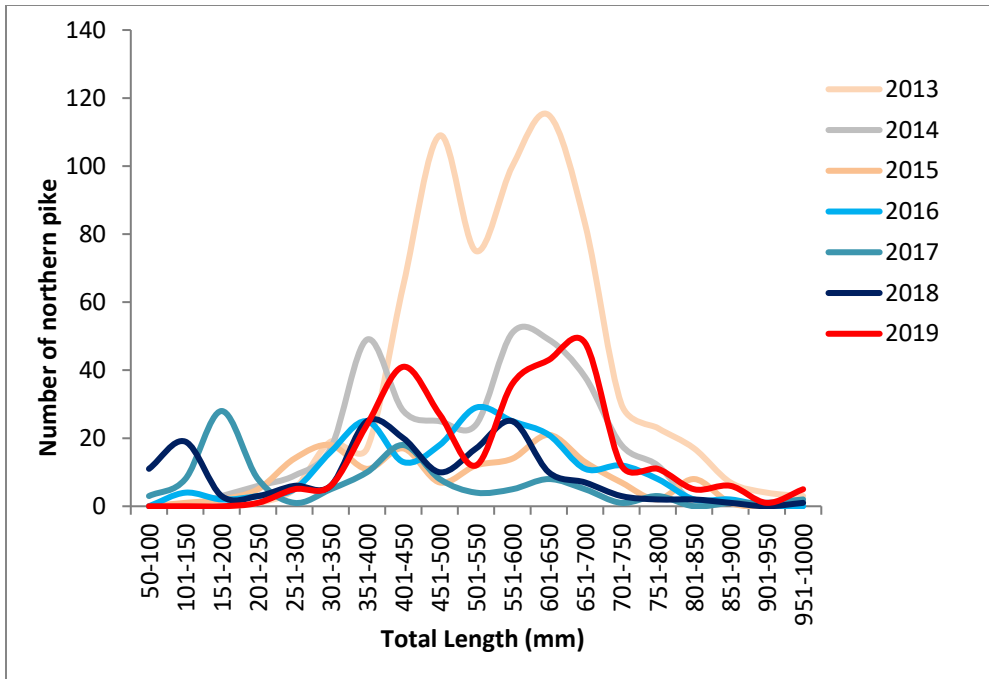


Figure 2. Length frequency of Yampa River northern pike captured in Project 98b, 2013 – 2019.

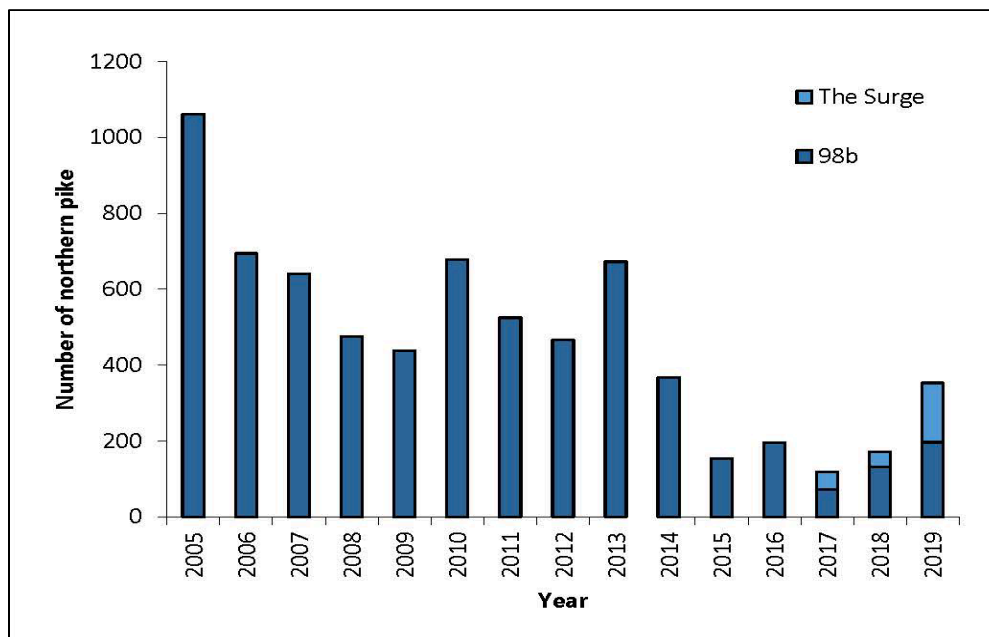


Figure 3. Number of northern pike removed annually from 2005 – 2019 in the Yampa River between Hayden and Craig, Colorado. The proportion of northern pike caught in 2019 as part of Project 98b (passes 1 – 6) are shown in dark blue and Surge/Project 125 passes are displayed in light blue. Gill netting efforts were initiated by CPW in 2014, hence the break in the horizontal axis.

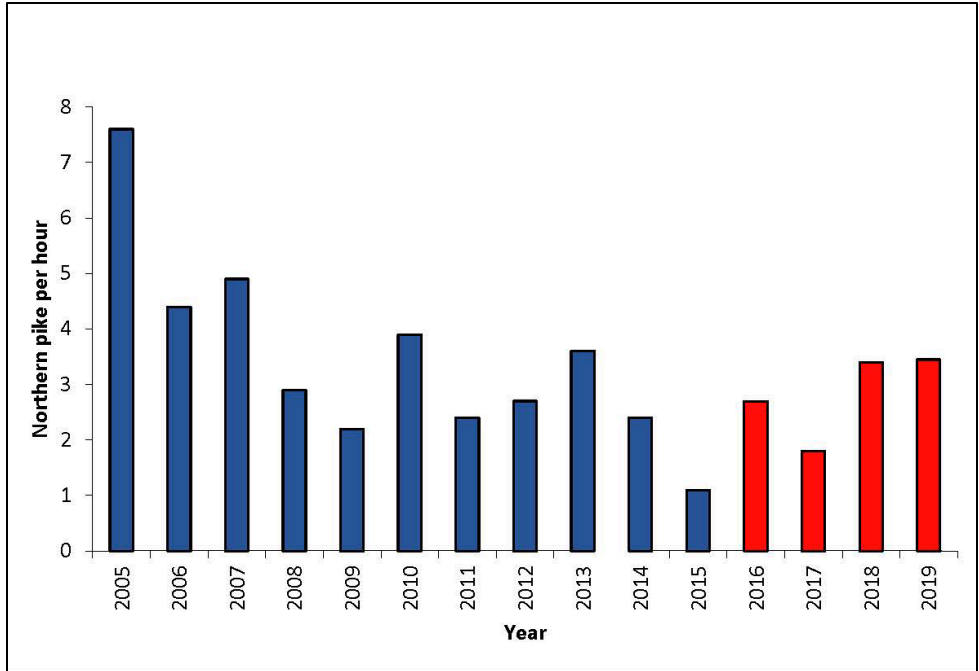


Figure 4. Overall northern pike catch rates per hour (CPUE) from 2005 - 2019 for the Project 98b study reach. Changes to northern pike removal and data collection methodology were employed beginning in 2016 (red bars) wherein effort was expended and recorded primarily in backwaters. This resulted in catch rates that were biased higher from 2016 through 2019. Gill netting efforts were initiated by CPW in 2014, hence the break in the horizontal axis.

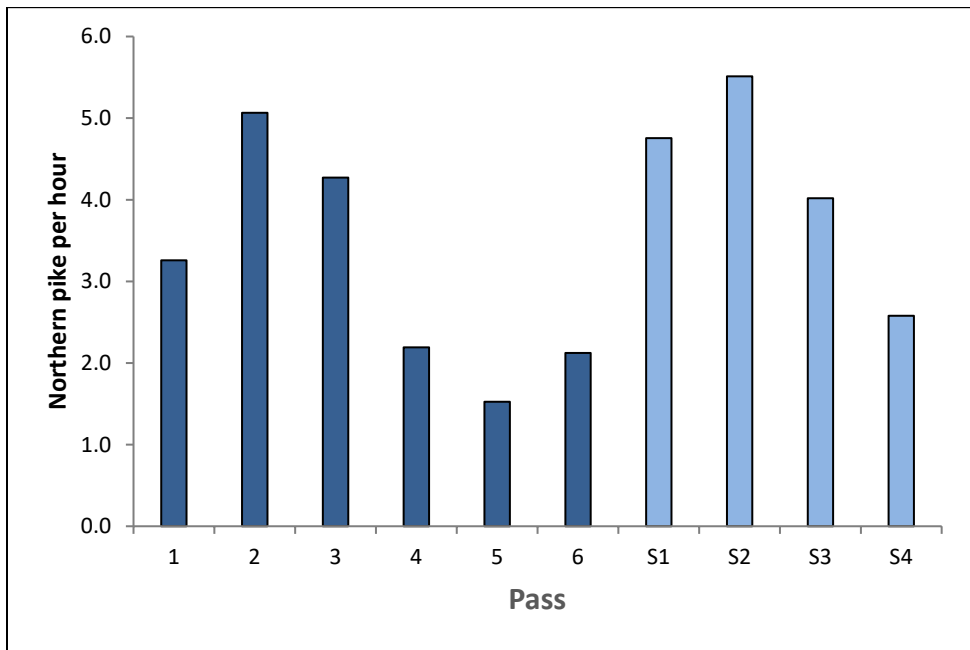


Figure 5. Catch rates for northern pike by pass in the Yampa River between Hayden and Craig, Colorado, 2019. Passes S1 – S4 were conducted as part of The Surge/Project-125. The Surge occurs after Project 98b passes are completed.

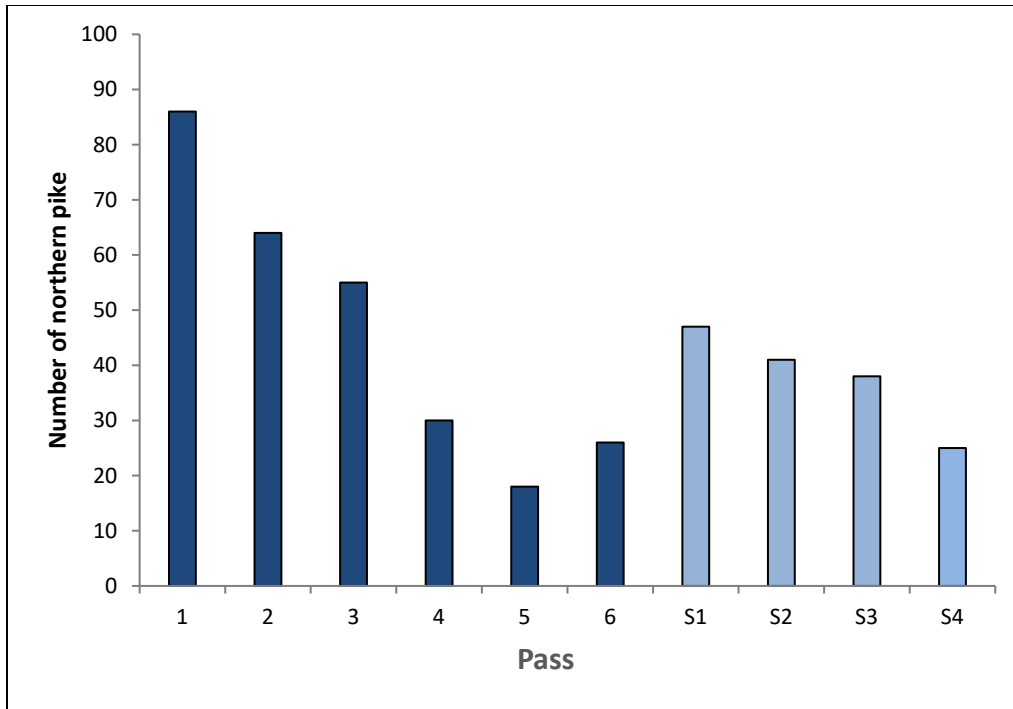


Figure 6. Northern pike (n) captured by pass in the Yampa River between Hayden and Craig, Colorado, 2019. Passes S1 – S4 were conducted as part of The Surge/Project-125. The Surge occurs after Project 98b passes are completed.

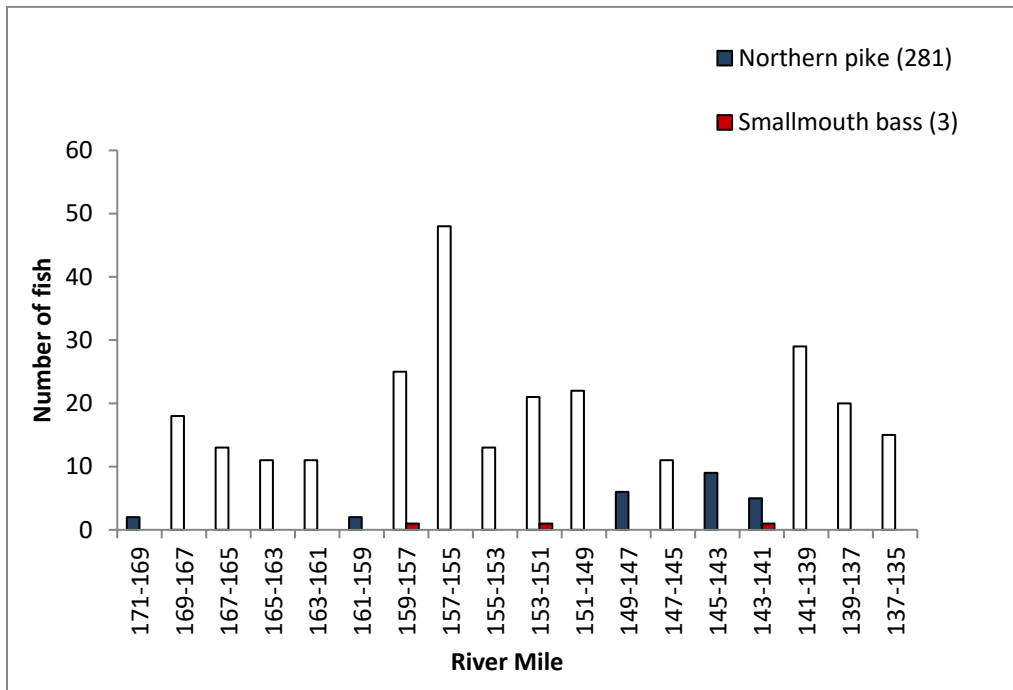


Figure 7. Total number of northern pike and smallmouth bass captured by river mile reach, Yampa River 2019 in Project 98b. Note that the northern pike total (n=281) includes 84 fish that were marked and released in pass one.

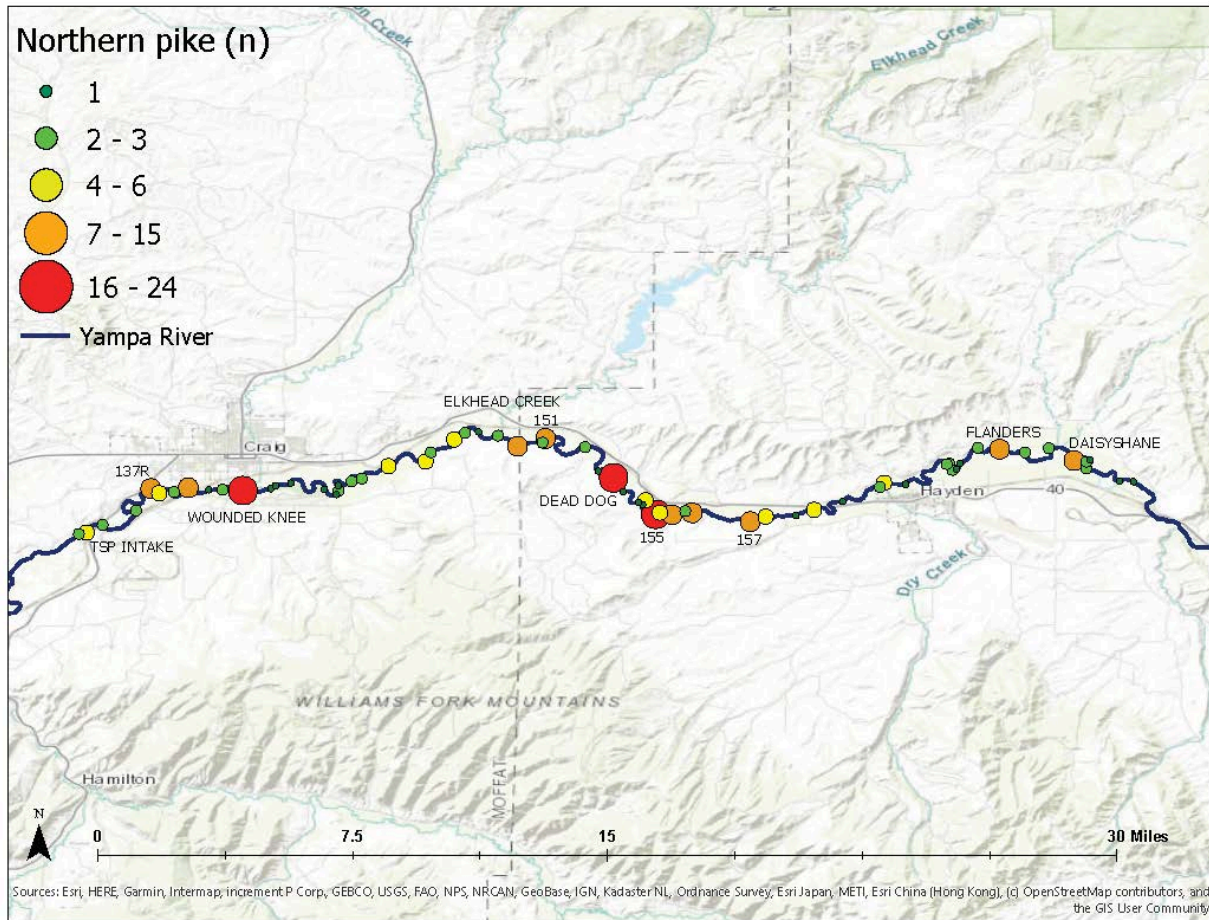


Figure 8. Project 98b northern pike captures (n) and capture locations in the Yampa River, 2019. More northern pike (n = 24) were caught in the Wounded Knee backwater than any other discrete location in this study in 2019. While the final 0.25 miles of Elkhead Creek was the site of most pike captures in 2017 (n=18) and 2018 (n=27), only three individuals were caught at this location in 2019.

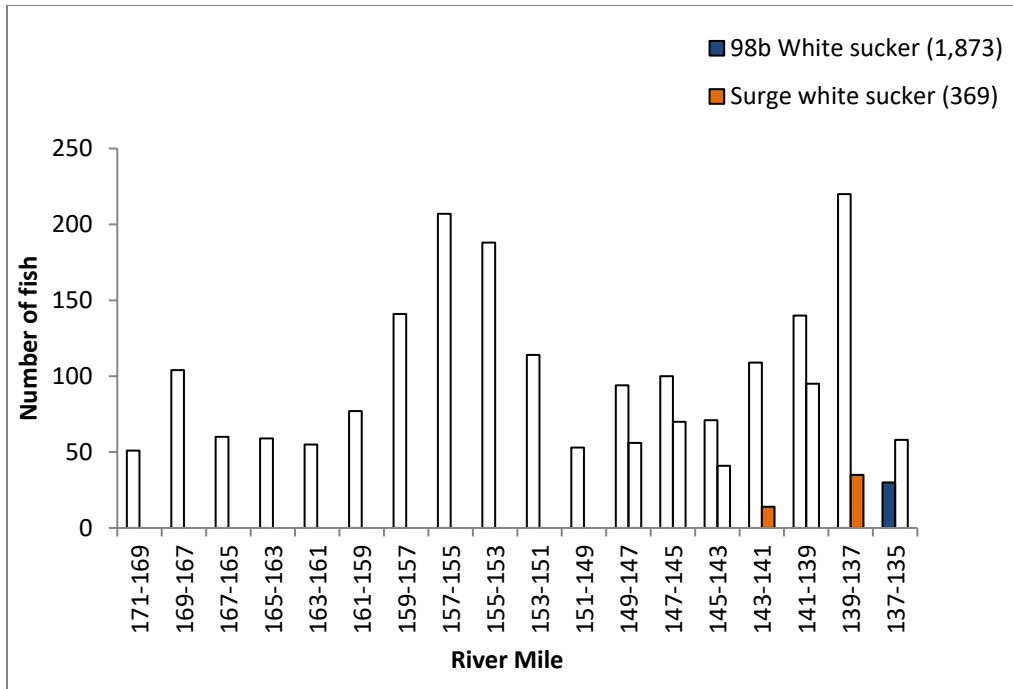


Figure 9 Total number of white sucker captured by river mile reach, Yampa River 2019 in Project 98b (blue bars) and The Surge/Project 125 (orange bars).

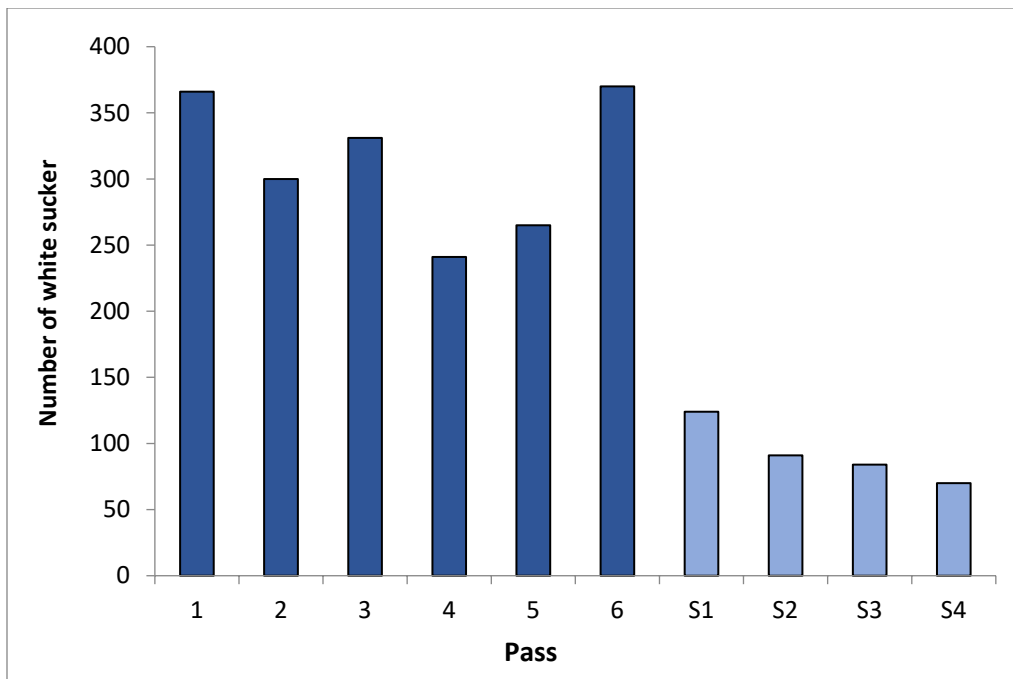


Figure 10. Number of white suckers removed by pass from the Yampa River between Hayden and Craig, in 2019. Passes S1 – S4 were conducted as part of The Surge/Project 125. The Surge occurs after Project 98b passes are completed.

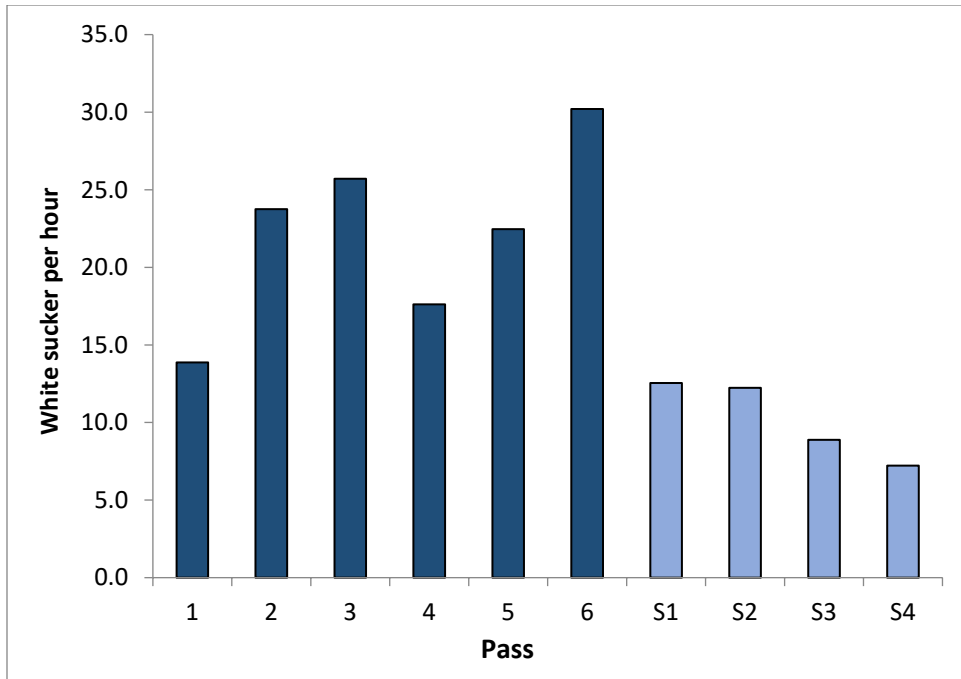


Figure 11. White sucker (n) captured by pass in the Yampa River between Hayden and Craig, Colorado, 2019. Passes S1 – S4 were conducted as part of The Surge/Project-125. The Surge occurs after Project 98b passes are completed.