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

II. Bureau of Reclamation Agreement Number: R15PG00083

   Project/Grant Period: Start date: 10/01/2014
   End date: 09/30/2019
   Reporting period end date: 9/30/2017
   Is this the final report? Yes _____ No X___

III. Principal Investigators:
    Chris 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 2018 we euthanized 15 smallmouth bass, 1,210 white suckers, and 171 northern pike. More northern pike were removed in 2018 than 2017. 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 2018 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

    We conducted six electrofishing passes within the 38-mile study section of the upper Yampa River where all passes were used as removal passes, and all northern pike, smallmouth bass, and white sucker captured were euthanized. The length of river
sampled varied among passes this year due to logistical constraints resulting from hiring delays and a short runoff season. Three full passes from the Hayden Pump Station boat ramp (RM 171.6) to the South Beach boat ramp (RM 134.5) and three abbreviated passes from the Dorsey boat ramp (RM 151.5) to South Beach were conducted between 9 April and 26 June 2018. The final 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. Smallmouth bass captured during passes 4 – 6 are reported in the Project 125 Annual Report (Hawkins 2018), however northern pike and white sucker are reported herein.

**Northern Pike**

We removed 171 northern pike from the study reach in 2018. We consider fish <300mm total length (TL) juveniles, fish ≥300mm TL adults, and fish ≥450mm TL as piscivores. Of the 171 fish removed in 2018, 42 were juveniles and 129 were adults, of which 78 were piscivores (Table 1). More northern pike were removed than in 2017, when 119 individuals (48 juveniles and 71 adults, of which 38 were piscivores) were euthanized.

Length-frequency of pike captured in 2018 showed greater representation by medium-sized adults than other size classes (Figure 1). The majority (75%) of the fish captured were adults, ranging from 317-968 mm. The majority (74% or 31 out of 42 total) of juvenile pike were caught during The Surge. Juvenile northern pike appear to recruit to electrofishing gear when runoff subsides, water temperature increases, and backwater accessibility becomes limited, conditions which are typically encountered after the bulk of Project 98b work is done.

The overall catch per unit effort (CPUE) in 2018 was higher than in any year since 2013 (Figure 2), yet the number of northern pike captured was the third lowest since 2005 (Figure 3). Slightly increased CPUE in 2016 was attributed to changes in data collection methods rather than higher northern pike densities in the Yampa River. That is, data collected in 2016 and later is biased higher when compared to previous data. Catch rates in the main channel of the Yampa River had been very low for years, so we decided to focus effort in backwater habitat to increase removal efficiency. Additionally, we began recording effort, location (UTM), and fish data (TL and number of northern pike caught) at the backwater scale instead of the two-mile reach scale. This method allows the determination of catch rates on the reach scale as well as the identification of where northern pike were captured within each two-mile reach. We expect that the increased resolution in our data will benefit future targeted northern pike removal, whether it is achieved by electrofishing, gill netting, or other methods.

Catch rates in 2018 were highest during the first pass (9 – 11 April, CPUE = 8.7 NP/hr; Figure 4), which is the highest catch rate for one pass produced in this project since 2005. Although this high catch rate is somewhat alarming, consideration should be given to the previously mentioned change in data collection protocol since 2016. Nevertheless, a total of 83 fish (Figure 5) were caught during this initial pass, which represents the most northern pike caught in a single pass since 2014 (Webber et al. 2014, Smith and Jones...
2015, 2016, 2017). This could partially be the result of delayed control efforts in 2016 when the first pass was not started until mid-June. Federal hiring shortcomings that resulted in late new seasonal employee arrival dates and prioritization of the Colorado pikeminnow population estimate (Project 128a) caused another reduction in effort during April and May 2018. The importance of beginning northern pike removal as soon as flows in the Yampa River allow has been emphasized in previous reports (Smith and Jones 2016, 2017) and will hopefully occur reliably in the future.

Northern pike removed within this study reach by CPW gill netting efforts immediately before this project begins each year have almost certainly affected our early season catch rates since 2014. In addition to gill netting removal effects, we suspect that over ten years of coordinated multi-agency (USFWS, LFL, and CPW) northern pike removal efforts have reduced the abundance of northern pike in this reach.

Northern Pike Tags
Floy tags were not found in any northern pike caught this year in Project 98b.

Smallmouth Bass
Fifteen smallmouth bass (180 – 373 mm TL; 2 juveniles < 200 mm, 13 adults ≥ 200 mm, 3 piscivores ≥ 325 mm) were captured in this study in 2018 (Figure 6) compared to 38 (97 - 355 mm TL) in 2017 (Figure 6; Smith & Jones 2017). The majority, or 12 individuals (average TL = 284 mm SE = ±17.5 mm), were caught at the Elkhead Creek confluence or up to ¼ mile upstream within Elkhead Creek. An additional 17 smallmouth bass (average TL = 150 mm SE = ±21.8 mm) were caught at this site during Surge passes (Hawkins 2018, in prep). Smallmouth bass escapement from Elkhead Reservoir into Elkhead Creek and the Yampa River likely caused the current bass problem in this river system (Modde and Smith 1995). A spillway block net was installed in the fall of 2016 to prevent future introductions, but despite the reservoir source being cutoff, Elkhead Creek continues to provide suitable habitat and temperatures for nonnative fish. Smallmouth bass spawning and nests were noted at this confluence in 2012 and 2013 (Webber 2012, 2013) and temperatures in Elkhead Creek can be suitable for spawning earlier than in the Yampa River, thereby possibly extending the growing season and survival of young-of-year bass within this reach.

White Sucker
We removed 1,210 white sucker (32 -525 mm TL) in 2018, compared to 1,211 white sucker (34 -544 mm TL) in 2017. Of these, 521 measured < 200 mm TL and 689 measured ≥ 200 mm TL, compared to 567 and 644 in 2017, respectively. The proportion of juvenile (< 200 mm TL) white sucker caught was noticeably higher in 2017 than 2016 (46.8% versus 12.7%; Smith and Jones 2017), and a similar juvenile proportion (43%) was captured in 2018. This might not reflect actual changes in Yampa River white sucker size structure. The majority of 2017 and 2018 sampling occurred post-runoff and similar to juvenile northern pike, juvenile white sucker appear to recruit to electrofishing gear after flows have subsided and water temperature has increased. White sucker catch rates were similar to 2016 and earlier. More white sucker were removed from reaches downstream of the Dorsey boat ramp (RM 149 – 135; Figure 8) because removal did not
occur upstream of this point during The Surge. Depletion between passes did not occur this year (Figure 9), similar to the past six years (Webber 2012, 2013, Webber et al. 2014, Smith and Jones 2015, 2016, 2017). 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

Although more northern pike were captured in 2018 than 2017, delays in the employee onboarding process reduced the amount of effort we were able to allocate to nonnative fish removal in April, May, and June 2018. If these logistical constraints had not reduced effort this year, it seems likely that we would have removed more northern pike and similar numbers of white sucker to years past and possibly more. We feel confident that similar hiring delays will not occur in the future.

Concerns regarding future access to the “151” backwater, particularly for gill netting efforts, prompted us to not enter this backwater in 2018 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:

• No bluehead sucker, flannelmouth sucker, or roundtail chub were caught on the Yampa River between Hayden and Craig, Colorado in 2018, nor were any of the four endangered fish species.

IX. Recommendations:

• 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 and conducting 2 passes after peak runoff to target the smallmouth bass spawn.

• 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.
• Using backwater-specific data to locate areas with potentially higher northern pike densities, investigate other northern pike removal methods such as “shock and block” backpack electrofishing to extend removal efforts later into the summer when northern pike could be confined to habitat such as main channel pools, off channel canals, and gravel pit ponds.

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

XI. FY 2018 Budget Status:
A. Funds Provided: $96,576
B. Funds Expended: $96,576
C. Difference: -0-
D. Percent of the FY 2018 work completed: 100%
E. Recovery Program funds spent for publication charges: -0-

XII. Status of Data Submission: Data was submitted to the STReaMS database manager on 19 September 2018.

XIII. Signed: Christian Smith 16 November 2018
Principal Investigator Date

References:


Table 1. Juvenile (includes all northern pike < 300 mm), adult (300 ≤ 449 mm), and piscivore (≤450 mm) class northern pike removed from the Yampa River for each pass in 2018. Dates sampled are indicated for each pass, with passes 1 through 3 being complete passes wherein all 38 miles of the study reach were sampled. Passes 4 through 6 occurred from the Dorsey boat ramp (RM 151.5) to South Beach (RM 134.5). Passes 4 through 6 also occurred in conjunction with The Surge/Project 125.

<table>
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<th>Adults</th>
<th>Piscivores</th>
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<td>27</td>
<td>48</td>
<td>83</td>
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<td>15</td>
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<td>3 - 12-14 June</td>
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<td>7</td>
<td>10</td>
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<tr>
<td>5 - 20-21 June</td>
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<tr>
<td>6 - 25-26 June</td>
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Figure 1. Length frequency of Yampa River northern pike captured in Project 98b, 2013 – 2018.

Figure 2. Overall northern pike catch rates per hour (CPUE) from 2005 - 2018 for Project 98b. 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 2018. Gill netting efforts were initiated by CPW in 2014, hence the break in the horizontal axis.

Figure 3. Number of northern pike removed annually in Project 98b from 2005 – 2018 in the Yampa River between Hayden and Craig, Colorado. The proportion of northern pike caught in 2018 passes 1 – 3 are shown in dark blue, with passes 4 – 6 (The Surge) displayed in light blue. Gill netting efforts were initiated by CPW in 2014, hence the break in the horizontal axis.

Figure 4. Catch rates for northern pike by pass, Yampa River 2018 in Project 98b. Passes 4 – 6 were concurrent with The Surge/Project 125 in 2018. The Surge typically occurs after Project 98b passes are completed.

Figure 5. Northern pike captured by pass in the Yampa River, 2018 in Project 98b. Passes 4 – 6 were concurrent with The Surge/Project 125 in 2018. The Surge typically occurs after Project 98b passes are completed.
Figure 6. Total number of northern pike and smallmouth bass captured by river mile reach, Yampa River 2018 in Project 98b.

Figure 7. Northern pike (n) captured in backwaters, Yampa River 2018 in Project 98b. More northern pike (n = 27) were caught within the final 0.25 miles of Elkhead Creek than any other discrete location in this study in 2018.
Figure 8. Total number of white sucker captured by river mile reach, Yampa River 2018 in Project 98b.

Figure 9. Number of white suckers removed by pass from the Yampa River between Hayden and Craig during 2018 in Project 98b.
Figure 10. Catch rates for white sucker by pass from the Yampa River between Hayden and Craig during 2018 in project 98b.