

I. Project Title: **Middle Yampa River northern pike removal and evaluation;
smallmouth bass removal and evaluation**

II. Bureau of Reclamation Agreement Number: R13AP40029

Project/Grant Period: Start date: July 11, 2013

End date: September 30, 2017

Reporting period end date: December 30, 2017

Is this the final report? This is the final report for this period, but
the study is ongoing within a new grant period.

III. Principal Investigator:

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IV. Abstract:

This project is one of several designed to facilitate the removal of northern pike and smallmouth bass within the Yampa River basin, with an evaluation of the efficiency of such efforts. The study area consisted of the middle Yampa River miles 134.2 to 50.5 which were sampled to capture and remove smallmouth bass and northern pike. In the 2017 sampling season, 236 northern pike individuals were handled and euthanized during electrofishing efforts. Northern pike electrofishing catch rate was 0.43 fish/hour, which is the lowest catch rate observed since intensive, annual electrofishing in the study area began in 2004. Please see the 2017 Final Report for Project #125 for a detailed analysis of smallmouth bass data collected in the study area. Crews also sampled for Colorado pikeminnow, but no fish were collected. Please see the 2017 Final Report for Project #128 for a detailed analysis of Colorado pikeminnow data collected in the study area.

V. Study Schedule:

Initial Year: 2005 (CDOW assisted Colorado State University (CSU) in 2004)

Final Year: Ongoing

VI. Relationship to RIPRAP:

This study involved removing northern pike and smallmouth bass from the middle Yampa River, and evaluating the efficiency of that effort.

Green River Action Plan: Yampa and Little Snake Rivers:

- III. Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management)
- III.A.1. Implement Yampa Basin aquatic wildlife management plan in reaches of the Yampa River occupied by endangered fishes. Each control activity will be evaluated for effectiveness and then continue as needed.
- III.A.1.b. Control northern pike.
- III.A.1.b. (1) Remove northern pike and other nonnative sport fishes from the Yampa River.
- III.B.2 Control nonnative fishes via mechanical removal
- III.B.2.e Remove smallmouth bass

VII. Accomplishments of FY 2017 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A. FY 2017 Tasks and Deliverables

Task 1. Establish landowner contacts and obtain permission to access riverside and backwater property for fish sampling.

Schedule: February-March 2017

Deliverable: **Task Completed**

Task 2. Plan logistics, hire and train personnel, order and maintain equipment, and prepare for sampling.

Schedule: January-March 2017

Deliverable: **Task Completed**

Task 3. Sample study area to capture and remove northern pike and smallmouth bass. Limited data entry

Schedule: April-Aug 2017

Deliverable: **Task Completed**

Task 4. Maintenance of equipment. Data entry, data analysis, and prepare final report. Present findings during the Annual Nonnative Fish Control Coordination Calls.

Schedule: August-November 2017

Deliverable: **Task Completed.** Annual Report Completed. Findings will be discussed during Annual Nonnative Fish Control Coordination Calls.

B. Discussion of Initial Findings and Shortcomings

Study Area

The study area for this project with regard to northern pike (NPK) has been consistent since 2005. It includes the entire portion of the middle Yampa River sampled by Colorado Parks and Wildlife (CPW) and Colorado State University (CSU) combined, from river mile (RM) 134.2 to
FY 2017 Ann. Rpt. Project #98a-2

50.5 (Figure 1). CPW samples Reach 1 (South Beach; RM 134.2 – 124.0), CSU samples Little Yampa Canyon (LYC; RM 124.0 – 100.0), CPW samples Reaches 2 through 5 (Juniper, Upper Maybell, Lower Maybell, Sunbeam, RM 100.0 – 60.6), and CSU samples Lily Park (RM 55.5 – 50.5) (Figure 1).

CPW Study Methods/Approach

Main Channel and Backwater Electrofishing

CPW and CSU completed electrofishing removal efforts for both NPK and smallmouth bass (SMB) in 2017. Since 2005, CPW has analyzed the combined NPK removal efforts of CPW and CSU in the middle Yampa River. As such, this report details the total efforts of both CPW and CSU for NPK removal in the middle Yampa River study area in 2017. From 2004-2012, a mark-recapture study was incorporated into the NPK removal effort to estimate NPK abundance. However, in an effort to increase NPK removal, population estimates have not been conducted since 2012. Since 2008, all SMB data collected by CPW have been submitted to CSU for a combined analysis of SMB; please see the 2017 Final Report for Project #125 for a detailed analysis of SMB data collected in the study area by both CPW and CSU.

Between RMs 134.0 and 50.5, crews conducted removal passes on each individual reach, although not every mile of river within a given reach was electrofished on every pass. Numbers of passes within reaches varied as hydrological conditions allowed to maximize capture efficiencies for target species, and to collect capture data from Colorado pikeminnow (CPM) for generation of a population estimate; please see the 2017 Final Report for Project #128 for a detailed analysis of CPM data collected in the study area by both CPW and CSU.

In addition to standard sampling within the study area, CPW, CSU, and the US Fish and Wildlife Service (USFWS) also participated in an enhanced sampling effort called the ‘Surge’. The Surge focused on the removal and disturbance of spawning adult SMB in river reaches with relatively high concentrations of adult SMB. Because NPK were also removed during passes accomplished under the Surge, additional removal passes that were accomplished during the Surge are accounted for in the following paragraphs describing effort.

In 2017, CSU conducted the first two electrofishing passes on Reach 2 (Juniper) and the first pass on Reach 1 (South Beach) to complete effort required for the CPM population estimate. This effort by CSU allowed CPW additional time to continue spring backwater netting efforts on the ascending limb of the hydrograph; please see the Spring Backwater Netting section later in this report for more information.

All fish were captured using ETS boat-mounted electrofishing gear. Electrofishing effort was recorded by reach sampled and by date. In addition, “block and shock” and “scare and snare” techniques were utilized with gill nets at the mouths of backwaters. Water conductivity and temperature were recorded at the beginning of each sampling day. All NPK captured were euthanized; none were translocated to any location. This was the fourth year in which no northern pike were translocated.

All NPK, SMB, roundtail chub (RTC), flannelmouth sucker (FMS), and bluehead sucker (BHS) were measured for total length (TL) to the nearest millimeter (mm) and most were weighed to

the nearest gram (g). NPK and SMB captured were examined for the presence of FLOY tags and fin clips. CPM, RTC, FMS, and BHS were scanned for the presence of internal, passive integrated transponder (PIT) tags. Individuals without PIT tags were implanted with a new PIT tag. PIT tags for all the aforementioned species were implanted in accordance with the protocol of the Upper Colorado River Endangered Fish Recovery Program. All CPM, RTC, FMS, and BHS were released back to the water immediately.

In nearly all cases, incidental centrarchids, cyprinids, catostomids, ictalurids, and salmonids were also identified to species, measured for TL to the nearest mm, and weighed to the nearest g. All non-native fish, excluding salmonids, were removed and euthanized. This was the fifth year of CPW's "net everything" approach to sampling. Previously CPW had only netted the target species: SMB, NPK, RTC, and CPM.

Catch per unit effort (CPUE) was reported in terms of number of NPK captured per electrofishing hour for the entire study area. In addition to overall CPUE, catch effort was reported for all seven river reaches within the study area. For these sub-sections, CPUE was broken down into four categories and reported for each pass. The four categories for which CPUE was reported were: (1) NPK < 300mm TL, (2) NPK ≥ 300mm TL, (3) NPK ≥ 450mm TL, and (4) Total NPK.

Spring Backwater Gill Netting

Spring backwater gill netting was a collaborative effort between CPW, USFWS, and CSU. Sixteen standardized 1.5" mesh size gill nets, ranging from 50' to 150', were set in 12 backwaters located between RMs 170.0 and 122.0. Backwater locations were kept consistent from 2016-2017. Two or three nets were set in each of the three largest backwaters.

Gill nets were set and pulled depending on water conditions. A net was not set until the backwater was inundated, and was pulled when the backwater disconnected from the river. Most locations had nets set for the duration of the project (March 22-May 3). Some locations either were not inundated at the start of the project, or had nets pulled when the upper end of the backwater connected to the river, converting the location to a flowing side channel. In 2017, backwater gill netting effort was expanded to a total of 43 days, compared to 19 days in 2016.

Nets remained set seven days a week and were checked daily for the duration of the project. All fish captured were identified to species, measured for TL to the nearest mm, and weighed to the nearest g. All non-native fish, excluding salmonids, were removed and euthanized. CPUE was reported as NPK per net-night and calculated for each backwater in addition to overall CPUE across all backwater locations.

Results and Discussion

General Overview-Main Channel and Backwater Electrofishing

A total of 21 different fish species, including catostomid hybrids, were captured within CPW study reaches in 2017 (Table 1). Overall, 549.05 hours were expended by CPW and CSU electrofishing the study area (Table 2). Electrofishing effort in 2017 was similar to 2016 in

which crews expended 557.65 hours (Noble 2016). The most amount of effort was completed by CSU in the Little Yampa Canyon reach (253.46 hours), while the Lily Park reach (39.47 hours) received the least amount of attention.

Northern Pike

Population Overview and Size Structure

NPK were first captured by electrofishing on April 12th, 2017 and were last captured using the same methodology on July 20th (Table 3). This time frame was consistent with electrofishing completed in 2016. Overall, CPW and CSU captured 236 individual NPK during electrofishing operations in 2017 (Tables 1 and 3). This was less than half of the number of individual NPK captured in 2016 (n=540) (Noble 2016). Adult northern pike (≥ 300 mm TL) represented 86.8% of the total NPK catch in 2017, comparable to the proportion of NPK adults collected in 2016 (85.6%) (Figure 2). Almost half (49.2%) of NPK encountered in 2017 were ≥ 450 mm TL, which was an increase from 32.8% in 2016. The largest NPK captured in 2017 was in Little Yampa Canyon and measured 852 mm. Only 31 juvenile NPK (< 300 mm TL) were collected in 2017, compared to 78 in 2016 (Noble 2016).

In previous years, NPK were marked with FLOY tags in upstream reservoirs, and also within the middle Yampa River to determine population abundance (mark-recapture). In 2017, no FLOY tagged NPK were captured. NPK recaptures have become increasingly rare since 2012 when the last NPK population estimate was generated.

Catch Per Unit Effort (CPUE) and Concentration Areas

In 2017, catch per electrofishing hour (CPUE/catch rate) for NPK was the greatest for those two reaches in which the greatest number of NPK were caught: Upper Maybell (n=76, 1.25 NPK/hour) and South Beach (n=68, 0.93 NPK/hour) (Table 2, Figures 3 and 4). Fifty one NPK were captured in the Little Yampa Canyon reach, but this reach also received the most amount of electrofishing effort (232.00 hours), and so catch rate was only 0.22 NPK/hour. The Lily Park reach had the third highest catch rate of 0.66 NPK/hour with 26 NPK captured. No NPK were captured in the Sunbeam reach, and therefore this reach had the lowest catch rate.

Combined electrofishing CPUE for all river reaches in 2017 was 0.43 NPK/hour, the lowest catch rate since intensive, annual electrofishing in the study area began in 2004 (Figure 5). The decrease in total number of NPK captured from 2016 to 2017 and the lowest NPK electrofishing catch rate since 2004 may be a result of several factors. The Yampa River experienced periods of below average flows in late April and late May of 2017 (Figure 6).

Low flows can eliminate productive NPK habitat, including eddies and slack water, as well as restrict boat access to backwater habitat. Additionally, spring backwater gillnetting efforts (discussed later in this report) have occurred since 2014. In 2017, more NPK were removed during backwater netting efforts (n=377) than by main channel electrofishing (n=236). A combination of low overall NPK abundance in the study area and effective removal of NPK by spring backwater gillnetting may have contributed to the low electrofishing catch rate observed in 2017.

NPK distribution is not geographically uniform, which is why removal efforts are not constant in all river reaches. Specific types of habitat, mainly backwaters, tributary mouths, eddies and other slack water areas, generally hold more NPK, and availability of these habitat types varies substantially between river reaches. Eighty three percent (n=195 of 236) of NPK captured by electrofishing were removed from the Upper Maybell, South Beach, and Little Yampa Canyon reaches, respectively (Table 2, Figure 4). Seventy six percent (n=408 of 540) of NPK were removed from the same three reaches in 2016 (Noble 2016). The utility of targeting removal efforts in areas where NPK concentrate most was balanced against various other goals of the field activities. Removal of SMB is an important consideration, and their preferred habitat often does not overlap with NPK. Electrofishing in 2017 also targeted CPM so that a population estimate could be generated for this species.

Colorado Pikeminnow

No CPM were captured by CPW in 2017, two fewer than 2016. The last year in which more than two CPM were captured by CPW was 2011, when 36 were encountered.

Roundtail Chub

A total of 30 RTC were captured by CPW during electrofishing efforts in 2017 (Table 4). In 2016, 33 RTC were captured; a single RTC was captured in 2015; and 34 RTC were captured in 2014 (Figure 7). An increased number of juvenile RTC were observed in 2017 compared to 2016. Of the 30 RTC captured, one fish was captured in the Juniper reach, five fish were encountered in the Lower Maybell reach, and 24 fish were captured in the Sunbeam Reach (Table 4 and Figure 8).

Spring Backwater Gill Netting

CPW completed 2017 spring backwater gill netting efforts to target spawning NPK for the second year as part of the Project #98a Scope of Work. This method of non-native fish control is relatively simple, efficient, effective, and inexpensive. Backwater netting commenced on March 22nd, 2017 and ended on May 3rd, 2017, when efforts were exchanged to meet main-channel electrofishing obligations. The backwater netting began with early spring runoff and when backwaters were connected to the main channel. Ripe NPK can be exploited from early April to mid-May as they seek backwater habitat for spawning (Hill 2005).

In 2017, 16 gill nets were set in 12 different backwaters (Figure 9). Two or three nets were set in each of the three largest backwaters (Lower Carpenter, 151, and Weber) in order to maximize capture probability and to compensate for damage to the nets caused by rodents, drifting wood, and other debris. Overall, 724 fish were captured in the 2017 spring backwater gill netting efforts (Table 5). Fifty two percent of those fish were comprised of NPK, while white sucker accounted for 39% (Figure 12). The only native fish captured during spring backwater gill netting in 2017 included two mountain whitefish.

Crews removed 377 NPK across six weeks of the 2017 spring backwater netting, compared to 236 NPK removed during 2017 electrofishing efforts from early May through late July. In total,

613 NPK were captured between spring backwater netting and electrofishing efforts in 2017, which is only 61% of the NPK encountered during spring backwater netting and electrofishing in 2016 (n=1009) (Noble 2016).

Of the 377 NPK captured during spring backwater netting in 2017, only 330 could be measured because 47 were partially eaten. Three hundred twenty six of 330 (98.8%) measurable NPK in 2017 were adult fish exceeding 300mm TL (Figure 10). In 2016, all measurable NPK (n=430 of 469) exceeded 300mm TL.

Catch rate was variable depending on the backwater sampled (Figure 11). The six largest backwaters (151, Lower Carpenter, Webber, Eagles Nest, Round Bottom, and Elgen) had catch rates greater than one NPK per net-night, while the six smallest backwaters (Gravel Pit, Upper Carpenter, Wyman, Ross, ColoWyo, and BLM) produced less than one NPK per net-night. Overall, the backwater gill nets produced an average of 1.1 NPK per net-night. This number decreased from 1.89 NPK per net-night in 2016. The highest CPUE, 2.69 NPK per net-night, was observed at the 151 backwater. The least productive backwater was Wyman, with only 0.06 NPK per net-night. The Wyman backwater had substantial beaver activity very close to the location where the gill net was set. The gill net was frequently and seriously damaged during the project period, which negatively affected the capture efficiency.

Significant Work Outside of Scope of Work

Elkhead Reservoir Spillway Net

On September 23, 2016 a net was installed upstream of the spillway within Elkhead Reservoir to control non-native fish escapement when the reservoir spills. In the spring and fall of 2017, CPW used gill nets to sample upstream (between the spillway net and the spillway) and downstream of the spillway within the stilling basing to evaluate the effectiveness of the spillway net per the Scope of Work for Project #C20. Please see the 2017 Final Report for Project #C20 for sampling details and results related to the Elkhead Reservoir spillway net.

2nd Annual Elkhead Reservoir Fishing Classic

The management goal of CPW within Elkhead Reservoir is to reduce populations of SMB and NPK, and replace these species with those that are compatible (largemouth bass, black crappie, and bluegill) with native fish conservation and recovery efforts. Reducing SMB and NPK from Elkhead Reservoir will minimize escapement risk and mitigate potential impacts on native fishes downstream. One tool being used to disadvantage these two species is incentivized angler harvest. Various methods can be used to incentivize harvest of a species; in the case of Elkhead Reservoir, and for the second year in a row, CPW has offered a tournament with valuable prizes awarded to anglers who harvest SMB and NPK. In 2017, the tournament was moved back a couple of weeks from 2016 to allow for warming of water temperature and to bolster participation by taking advantage of the July 4th holiday weekend. The 2017 tournament was held from June 24th through July 2nd, which included nine days and two weekends. Across the tournament, 332 anglers removed 963 SMB (Figure 13) and 395 NPK (Figure 14) from the reservoir. This is a substantial increase from the 2016 tournament, in which 57 anglers removed 529 SMB and 53 NPK. Similar proportions of SMB size classes were removed by anglers in

2017 and 2016 (Figure 13). A larger range of northern pike size classes were caught by anglers in 2017 compared to 2016, including young-of-year fish (50mm TL-150mm TL) and juveniles (<300mm TL) (Figure 14).

CPW personnel staffed the check-in station during the tournament and any fish that were alive during check in were euthanized. Cash awards, fishing gear, and other prizes were awarded to participating anglers. Anglers earned a tournament ticket for every SMB and NPK they harvested. Biologists implanted internal PIT tags into one SMB and one NPK in advance of the tournament. The 2017 tagged SMB was harvested during the tournament, but the 2017 tagged NPK was not harvested during the tournament. So, an angler won a cash award during the drawing of the tournament tickets at the end of the event. Two anglers turned in fish containing PIT tags associated with the 2016 tournament and were also awarded prizes. Cash awards were provided to the anglers who caught the most SMB and the most NPK over the duration of the tournament. Fishing gear and other prizes were also awarded to anglers daily for six categories, including the most SMB and NPK harvested, and the smallest and largest SMB and NPK harvested.

Overall, the tournament was well-received by both local anglers as well as those who traveled from the East Slope of Colorado to participate. Moving the tournament to later in June, promoting tournament advertising on both sides of the Continental Divide, as well as replacing a grand prize boat/motor/trailer award with cash awards may explain the improved angler turnout and harvest rate in 2017.

VIII. Additional Noteworthy Observations:

No additional noteworthy observations were found outside of what is discussed above.

IX. Recommendations:

- A. Continue to increase backwater gill netting effort. Backwater netting appears to be more efficient at capturing NPK during the early season and runoff, and affords a greater chance of removing adults pre-spawn.
- B. Consider shifting electrofishing effort to time periods and concentration areas where NPK are most vulnerable to capture.
- C. Continue work to control potential NPK source populations. Prioritize work schedule to focus on populations of immediate concern.
- D. Continue marking and documentation of the three species and endangered fishes, when they are encountered.
- E. Continue evaluating the efficacy of netting all fish, including white suckers. Substantial effort is given to netting, processing, and disposing of white suckers. The realized benefits of this practice should be better understood to determine whether to continue the practice.
- F. Continue contacts with Yampa River landowners and stakeholders before, after, and during the study. Develop techniques that target larval and juvenile NPK to allow efficient exploitation of additional life stages.

- X. Project Status: This project is considered on track, with minor revisions to be considered. Additional evaluation of project commitments and efforts will be made internally by CPW in 2017. Additional refinement of the techniques used in the study is appropriate and will serve to further increase the efficiency of removal efforts.
- XI. FY 2017 Budget Status:
- A. Funds Provided: \$224,474
 - B. Funds Expended: \$224,474
 - C. Difference: \$0
 - D. Percent of the FY 2017 work completed: 100%
 - E. Recovery Program funds spent for publication charges: \$0
- XII. Status of Data Submission: Data for Colorado pikeminnow collected by CPW will be provided to the database Manager by March 1, 2018.
- XIII. Signed: Tory Eyre November 10, 2017
Principal Investigator Date

Acknowledgements: The author wishes to thank previous 98a lead biologists Cory Noble, CPW, Kyle Battige, CPW, and Boyd Wright, CPW for their assistance during field work and analysis, Jenn Logan, CPW, for her significant contributions of time and experience in the field, and Lori Martin, CPW, for providing important assistance to field work and analysis this season and for heading the project between 2004 and 2007. Thank you to Harry Crockett for reviewing and providing valuable feedback for drafts of this report. The author also appreciates the assistance of all CPW Area 6 personnel, CPW statewide aquatics personnel and personnel from CSU, USFWS and other government agencies who assisted during the field season and with administration of the project. The author recognizes Chris Smith, Tildon Jones, Cam Walford and John Hawkins for sharing and exchanging data. The contributions of Ed Kluender, Chris Smith, and their crews during backwater netting is greatly appreciated.

Literature Cited:

- Hill, C.G. 2005. Dynamics of northern pike spawning and nursery habitat in the Yampa River. Report to the Colorado River Recovery Implementation Program
- Noble, C. 2016. Middle Yampa River northern pike removal and evaluation. Annual Report to the Colorado River Recovery and Implementation Program

Appendix: Tables and Figures

Table 1. A summary of the total number of individuals captured during electrofishing in the middle Yampa River in 2017. Non-natives that were lethally removed included: northern pike, smallmouth bass, black bullhead, black crappie, brook stickleback, creek chub, common carp, green sunfish, fathead minnow, sand shiner, white sucker, and all white sucker hybrids.

Species	Number of Individuals Captured
Northern Pike	236 (CSU 120 + CPW 116)
Smallmouth Bass	1412
Roundtail Chub	30
Black Bullhead	5
Black Crappie	3
Bluehead Sucker	140
Brook Stickleback	6
Brown Trout	68
Creek Chub	37
Common Carp	19
Green Sunfish	18
Flannelmouth Sucker	40
Fathead Minnow	26
Mountain Whitefish	54
Rainbow Trout	21
Sand Shiner	14
Speckled Dace	5
White Sucker	3864
White Sucker x Bluehead Sucker Hybrid	21
White Sucker x Flannelmouth Sucker Hybrid	95
Flannelmouth Sucker x Bluehead Sucker Hybrid	1
Total Individual Fish Processed	6115

Table 2. The number of NPK captured for each river reach in the middle Yampa River study area along with total electrofishing effort (hour) and catch per unit effort (CPUE) in 2017 . Each parameter by river reach is broken down further to show numbers for NPK in three separate size categories: < 300 mm TL, ≥ 300 mm TL, and ≥ 450 mm TL.

	South Beach	Little Yampa Canyon	Juniper	Upper Maybell	Lower Maybell	Sunbeam	Lily Park	Total: All Reaches
NPK Captured	68	51	12	76	3	0	26	236
< 300 mm TL	14	5	3	9	0	0	0	31
≥ 300 mm TL	54	46	9	67	3	0	26	205
≥ 450 mm TL	23	20	5	46	1	0	21	116
Effort (hr.)	73.24	232	49.08	60.88	45.62	48.79	39.47	549.05
NPK CPUE	0.93	0.22	0.24	1.24	0.04	0.00	0.66	
< 300 mm TL	0.19	0.02	0.06	0.15	0.00	0.00	0.00	
≥ 300 mm TL	0.74	0.20	0.18	1.10	0.04	0.00	0.66	
≥ 450 mm TL	0.30	0.09	0.10	0.76	0.02	0.00	0.53	

Table 3. Middle Yampa River sampling season 2004 to 2017. 1st NPK Capture was the date for a given year when the NPK was captured by electrofishing. Last NPK Capture was the date for a given year when the last northern pike was captured by electrofishing. # Days Between 1st and Last Capture was number of calendar days between dates listed for a given year.

Year	Date of 1st NPK Capture	Date of Last NPK Capture	# Days Between 1st and Last Capture
2004	4/21/2004	7/8/2004	78
2005	4/22/2005	7/21/2005	90
2006	4/21/2006	7/4/2006	74
2007	4/17/2007	6/30/2007	74
2008	4/15/2008	7/15/2008	91
2009	4/7/2009	7/14/2009	98
2010	4/13/2010	7/11/2010	89
2011	4/26/2011	8/22/2011	118
2012	4/17/2012	6/19/2012	63
2013	4/18/2013	7/12/2013	85
2014	4/21/2014	7/24/2014	94
2015	5/5/2015	6/25/2015	51
2016	4/19/2016	7/28/2016	100
2017	4/12/2017	7/20/2017	99

Table 4. Number of roundtail chub >150mm TL capture events, number of roundtail chub marked, number of roundtail chub recaptures, number of roundtail chub released, number of roundtail chub removed, and number of roundtail chub mortalities for the middle Yampa River in 2017.

<u>River Reach</u>	<u>#RTC Capture Events</u>	<u>#RTC Marked</u>	<u>#RTC Recaptures</u>	<u>#RTC Released</u>	<u>#RTC Removed</u>	<u>#RTC Mortalities</u>
South Beach	0	0	0	0	0	0
Juniper	1	0	0	1	0	0
Upper Maybell	0	0	0	0	0	0
Lower Maybell	5	1	0	5	0	0
Sunbeam	24	9	4	24	0	0
<u>Total</u>	30	10	4	30	0	0

Table 5. A summary of the total number of individuals captured during spring backwater gill in the middle and upper Yampa River in 2017. Non-natives that were lethally removed included: northern pike, white sucker, black bullhead, and all white sucker hybrids.

Species	Number of Individuals Captured
Northern Pike	377
White Sucker	281
Black Bullhead	14
Brown Trout	19
Rainbow Trout	26
Mountain Whitefish	2
White x Bluehead Hybrid	1
White x Flannelmouth Hybrid	4
Total Number Individuals Captured	724

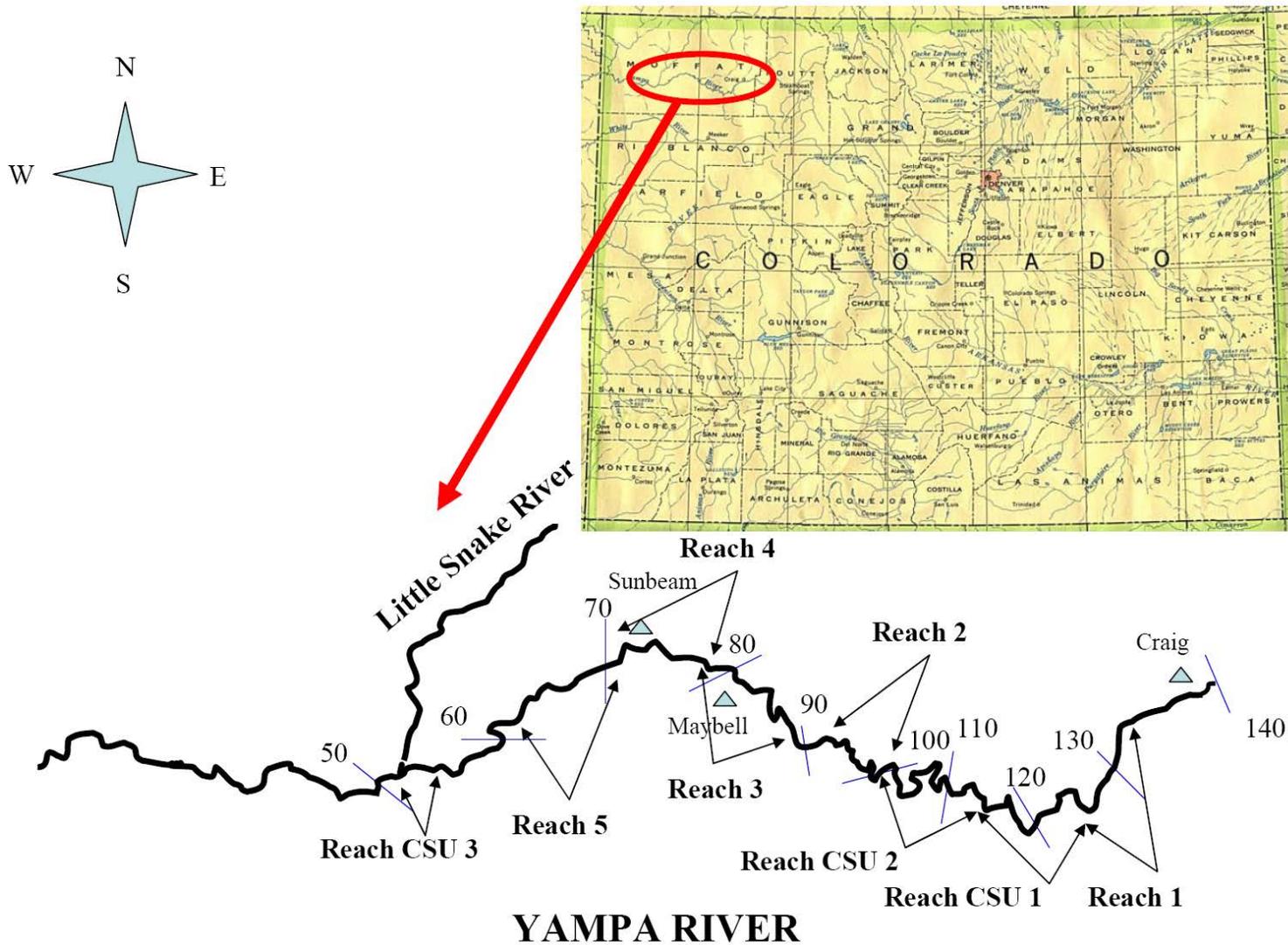


Figure 1. River reaches of the middle Yampa River sampled by CPW and CSU (Graphics courtesy of P. Martinez and R. Anderson)

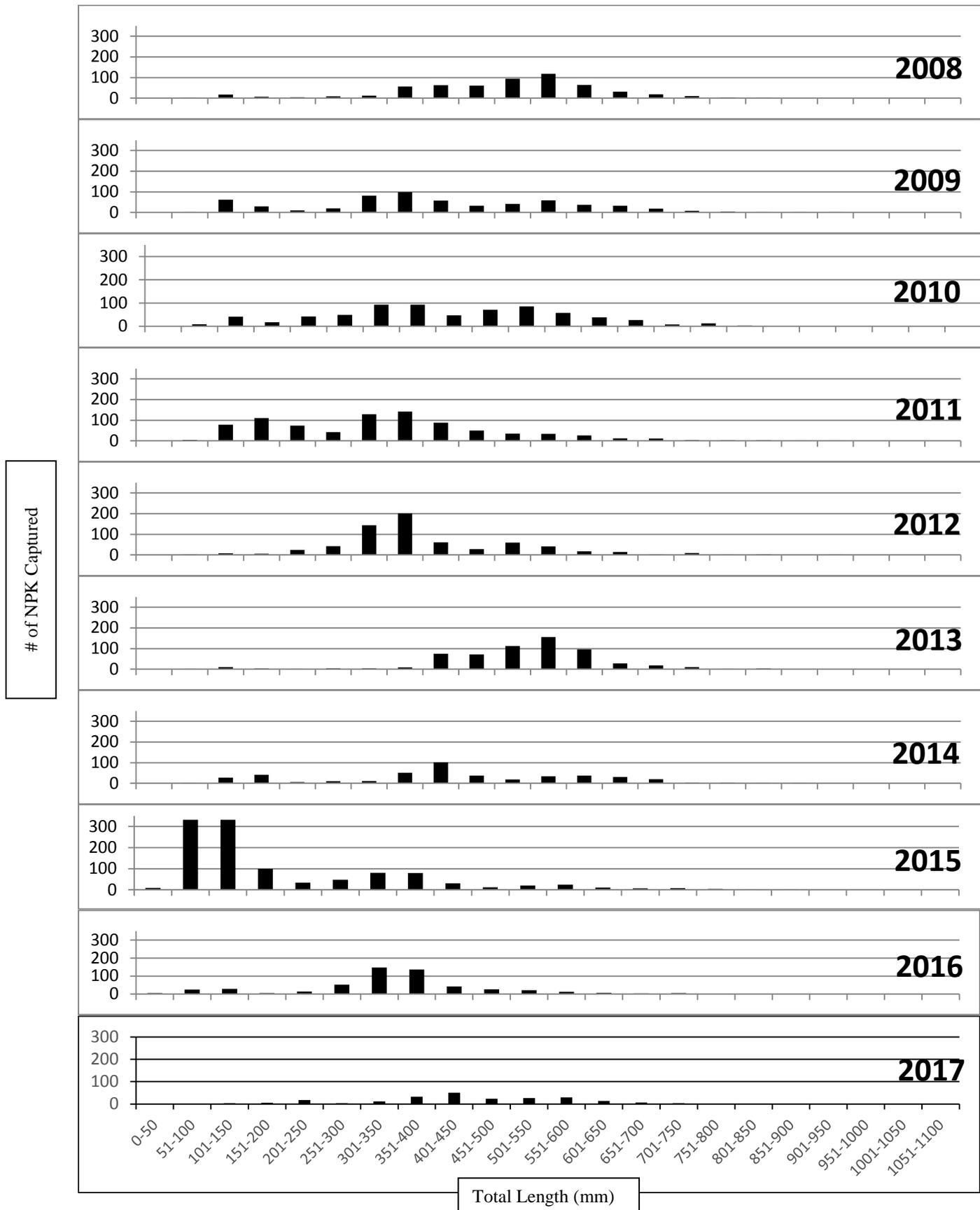


Figure 2. NPK total length frequency distributions, in the middle Yampa River, South Beach to Lily Park (RM 134.2-50.5), from 2008-2017.

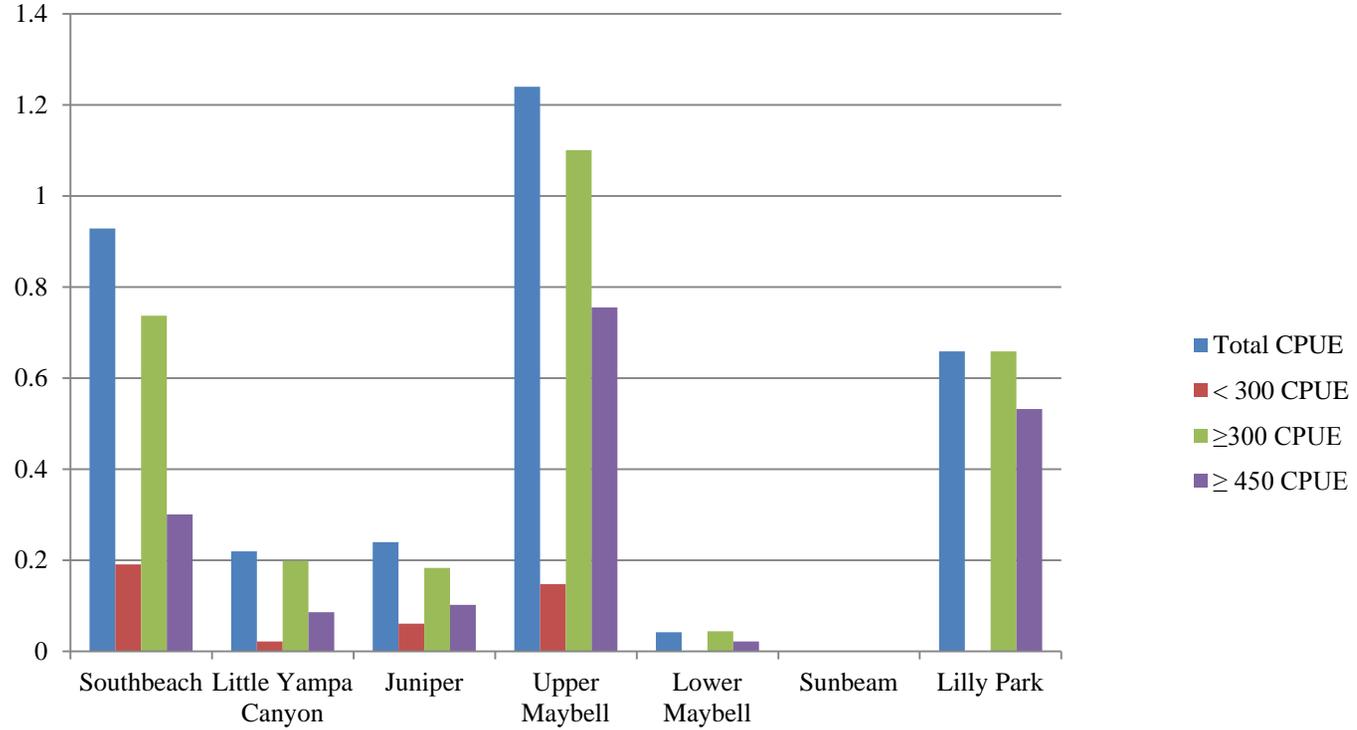


Figure 3. Total NPK catch per unit effort, and catch per unit effort for juvenile (<300 mm TL) and adult (≥300 mm TL and ≥450 mm TL) by river reach in the middle Yampa River in 2017.

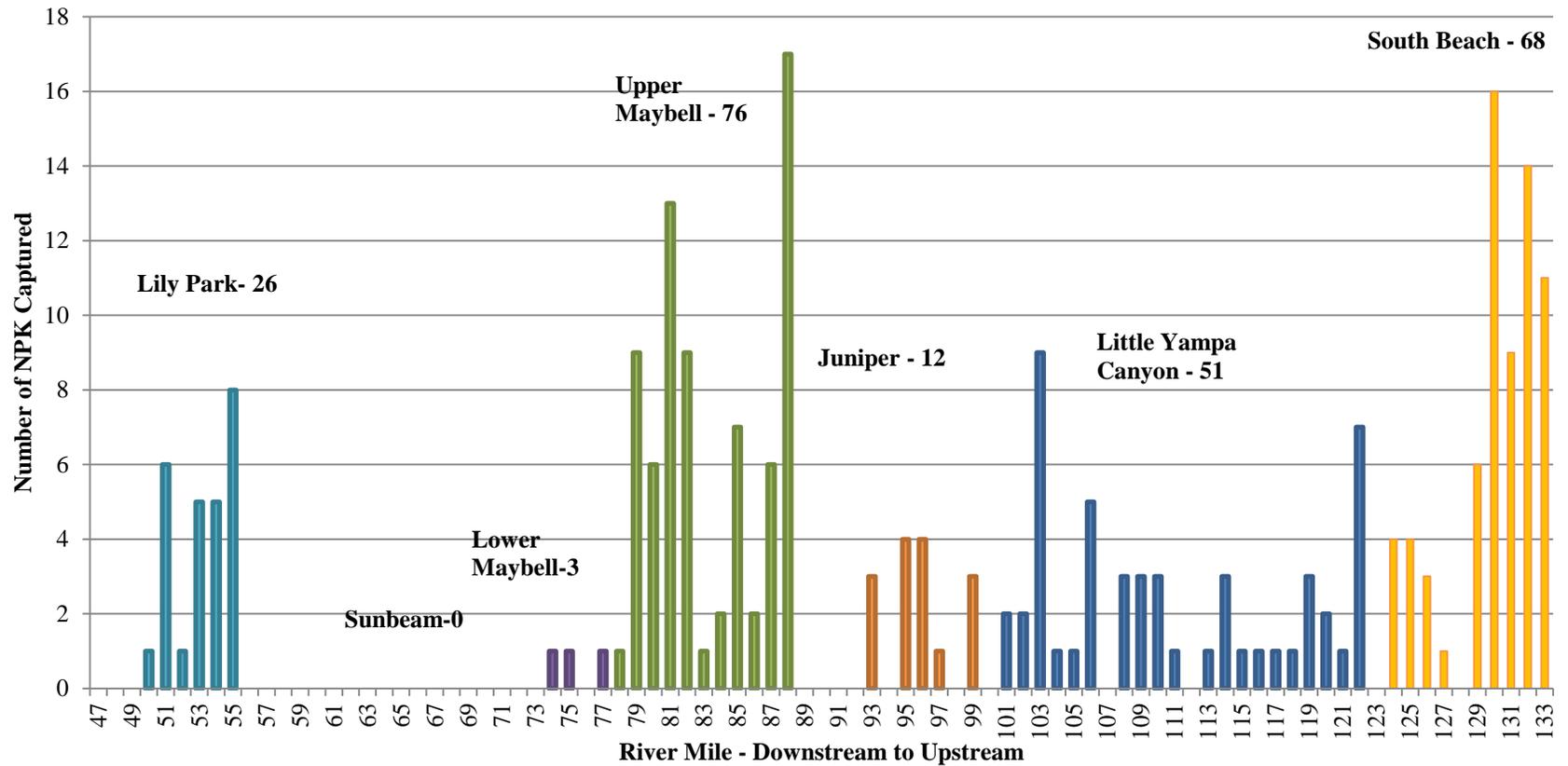


Figure 4. Number of NPK captured within each river mile of the middle Yampa River study area during 2017. Each color represents a different river reach (labeled above bars).

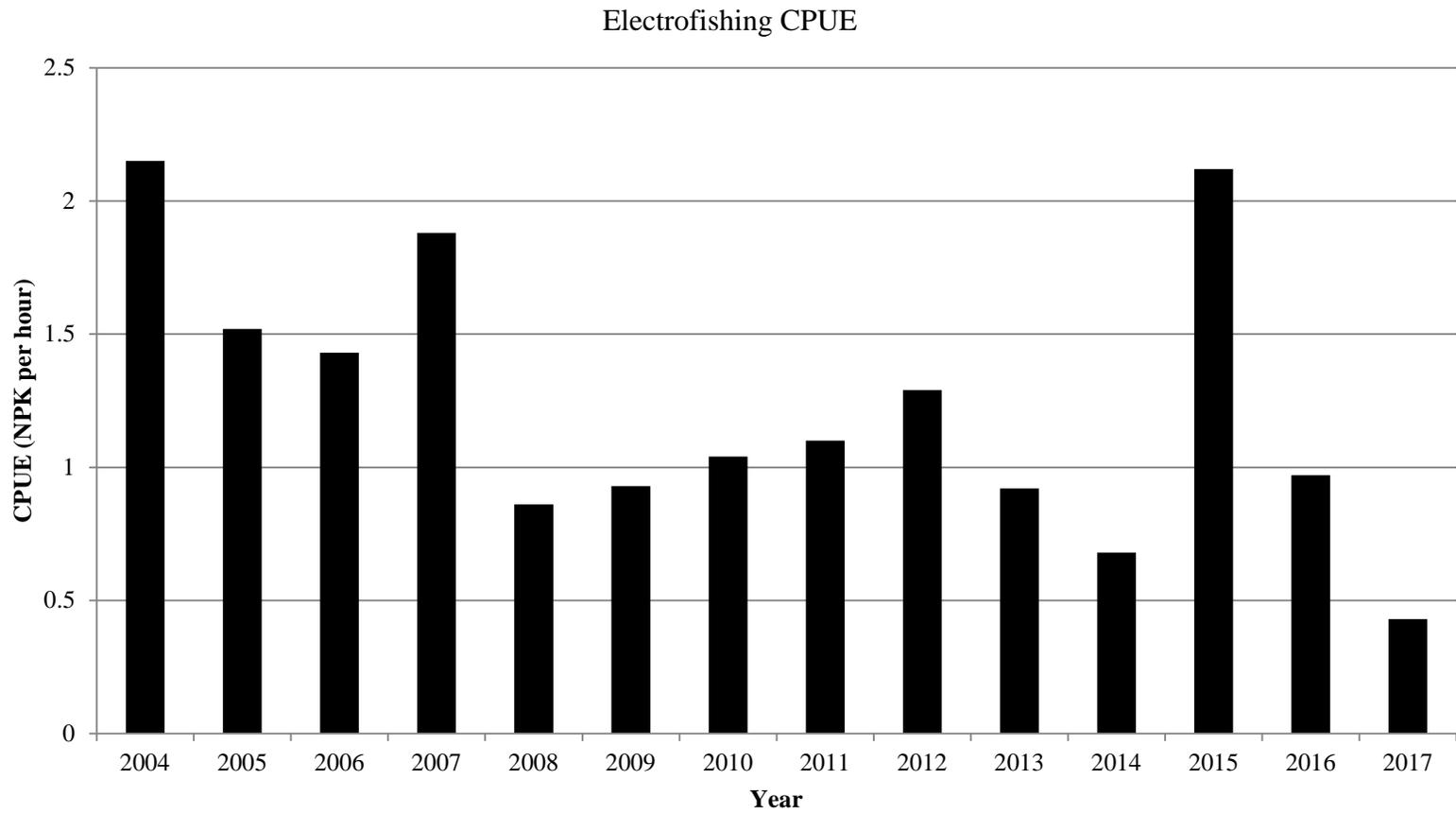


Figure 5. NPK catch per unit of electrofishing effort across all passes in the study area of the middle Yampa River sampled by CPW and CSU, from 2004 through 2017.

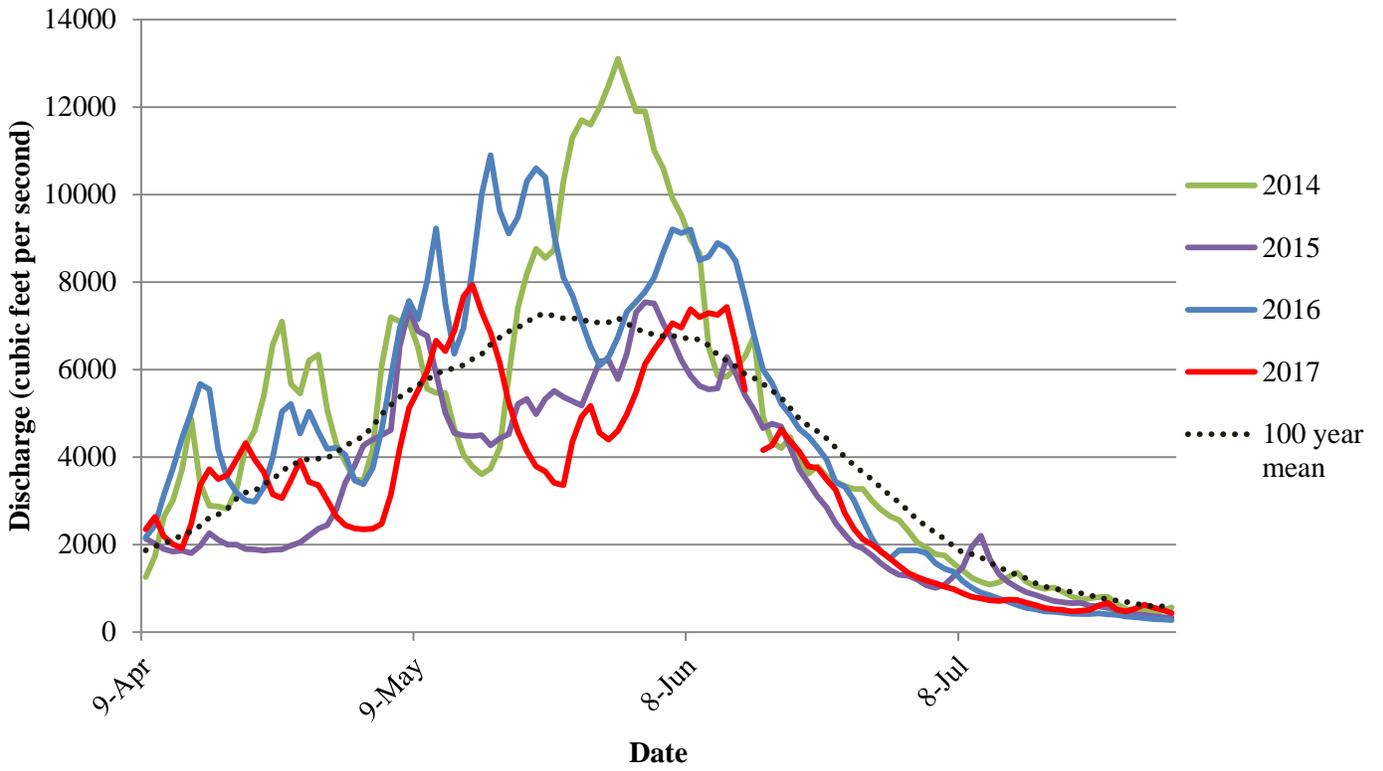


Figure 6. Mean daily discharge for the Yampa River at the United States Geological Survey Maybell gage station for 2014 to 2017 spring runoff. Dotted line represents the 100 year mean of daily mean discharge values. Peak runoff in 2017 occurred on May 15th (7,930 cfs) (Flow data courtesy of waterdata.usgs.gov).

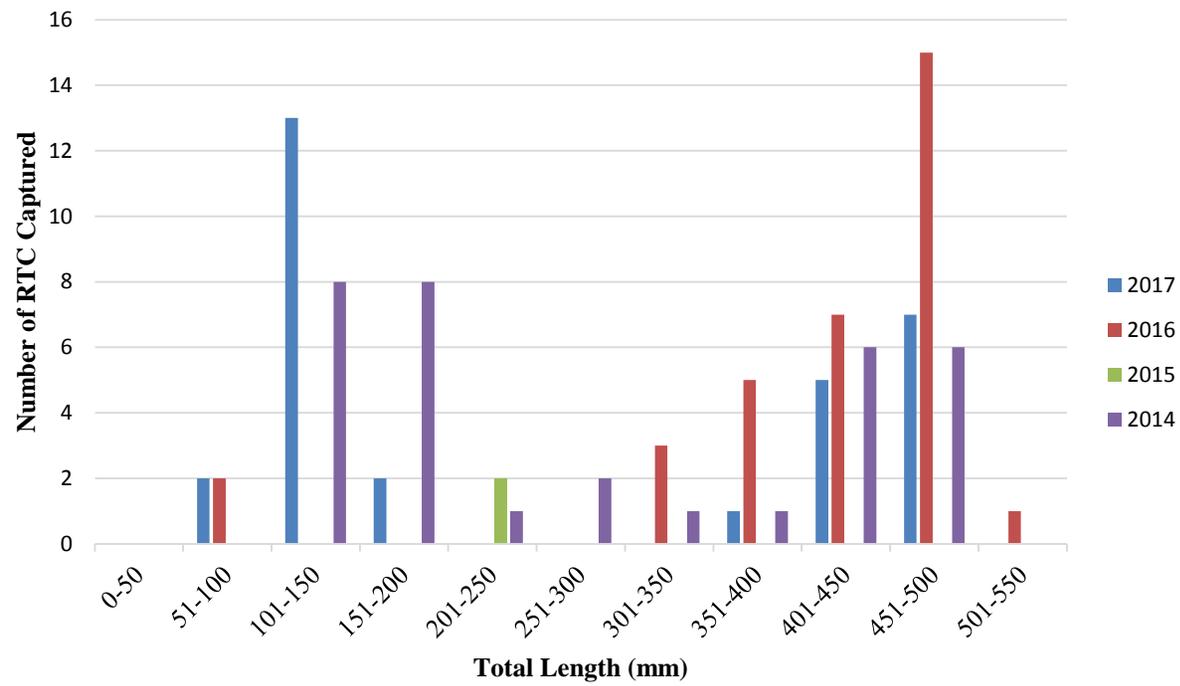


Figure 7. RTC total length (mm) frequency distribution for the middle Yampa River study area between 2014 and 2017.

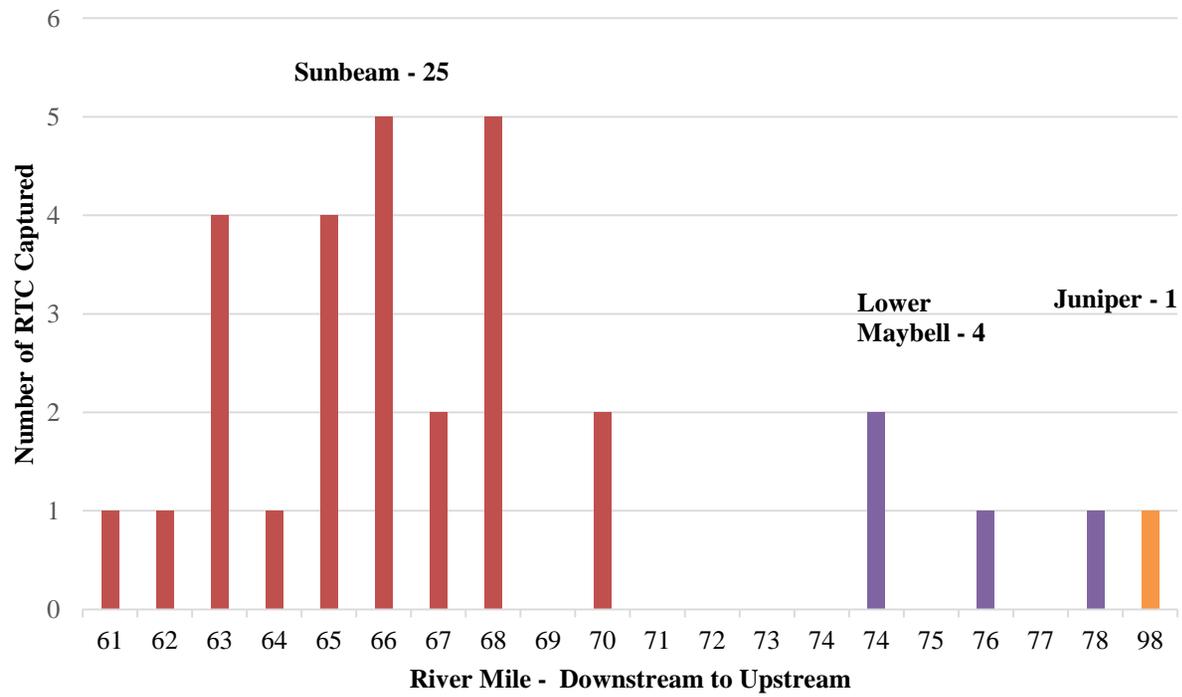


Figure 8. RTC capture locations in the middle Yampa River study area in 2017. No RTC were captured upstream of River Mile 98. Each color represents a different river reach (labeled above bars).



Figure 9. Satellite image showing 12 spring backwater gill netting locations in 2017. Backwater gill netting locations are spread along the middle and upper Yampa River between river miles 122.5 and 169.2 (imagery courtesy of Google Earth).

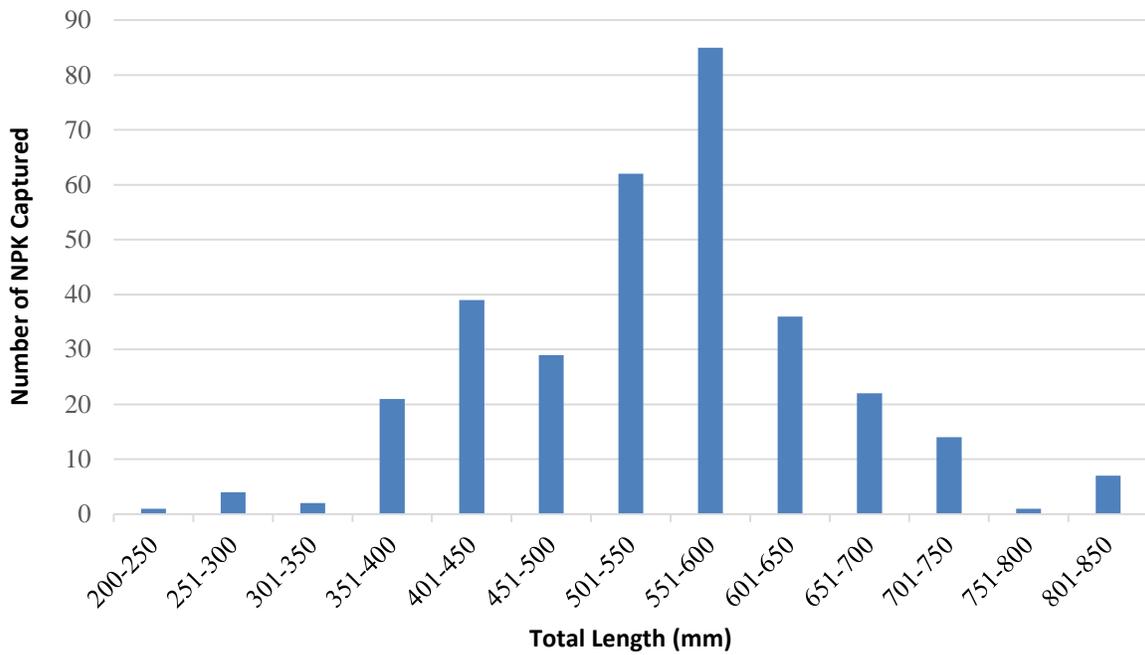


Figure 10. NPK length frequency distribution for fish captured during spring backwater gill netting in the middle and upper Yampa River in 2017. An additional 47 northern pike captured could not be measured due to being partially eaten while in the gill net.

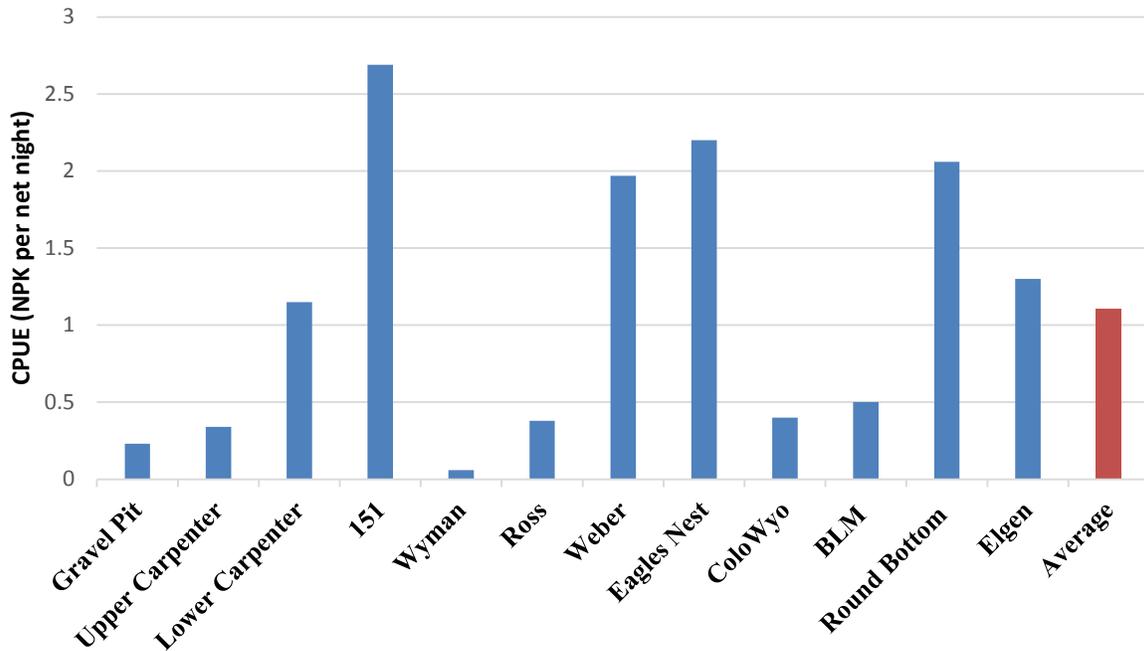


Figure 11. NPK catch per unit effort by backwater (upstream to downstream) during spring gill netting in the middle and upper Yampa River in 2017.

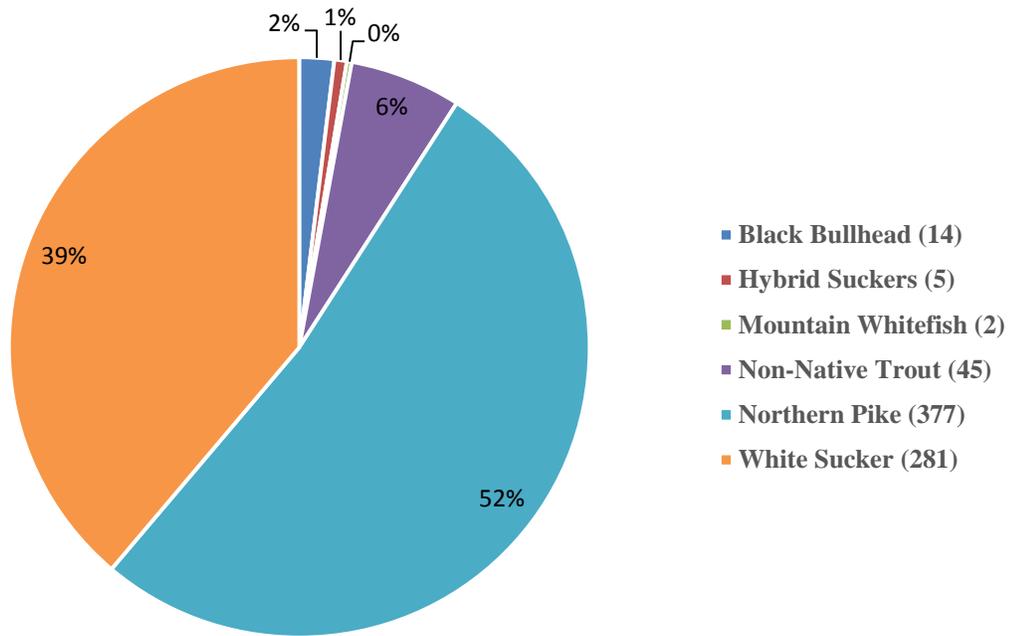


Figure 12. Relative abundance of fish captured during spring backwater gill netting in the middle and upper Yampa River in 2017. Non-native trout species included rainbow and brown trout.

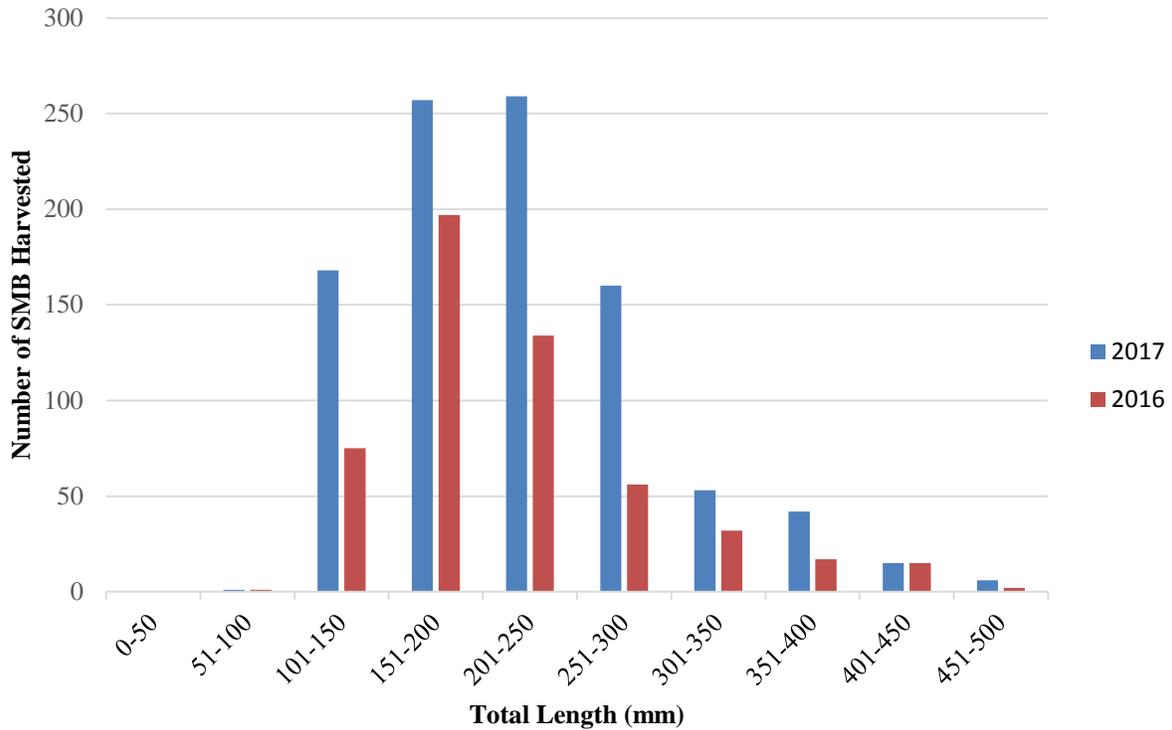


Figure 13. Length frequency distribution for SMB removed during the Elkhead Reservoir Fishing Classic in 2017 (n=963) and 2016 (n=529).

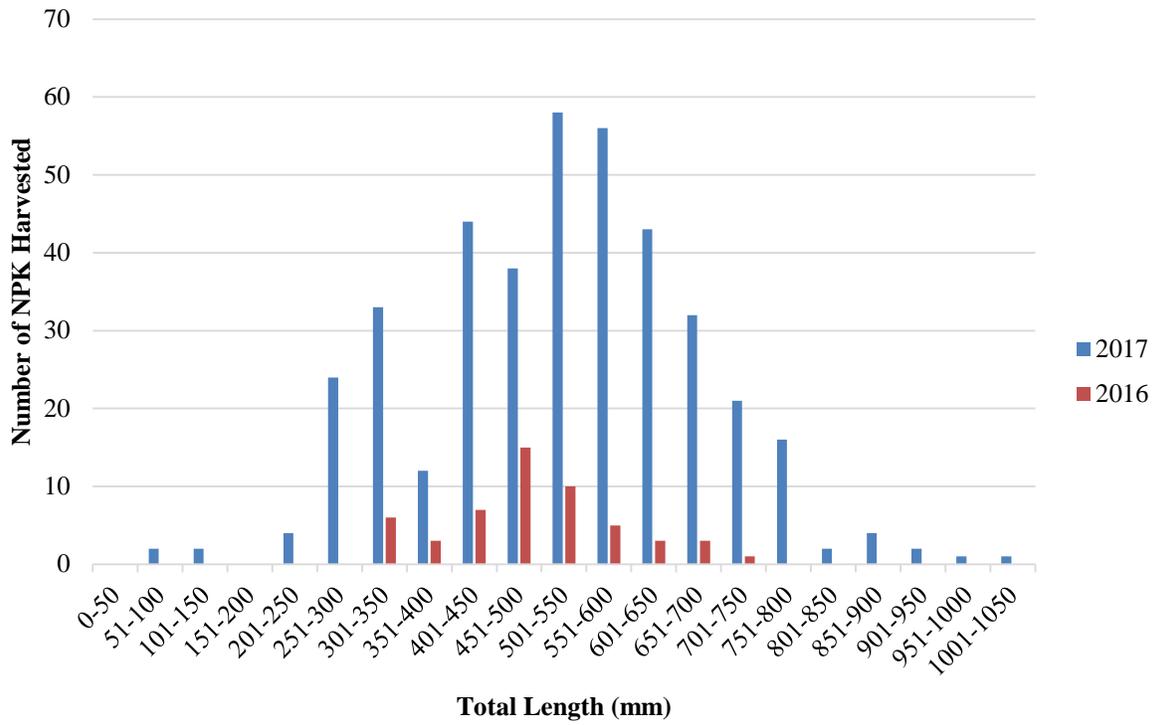


Figure 14. Length frequency distribution for NPK removed during the Elkhead Reservoir Fishing Classic in 2017 (n=395) and 2016 (n=53).

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: #R13AP40029

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 98a

Project Title: Middle Yampa River northern pike removal and evaluation; smallmouth bass removal and evaluation

Principal Investigator:

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Project/Grant Period: Start date (Mo/Day/Yr): 7/11/2013
 End date: (Mo/Day/Yr): 9/30/2017
 Reporting period end date (Mo/Day/Yr): 12/30/2017
 Is this the final report? This is the final report of this period, but
 the study is ongoing within a new grant period.

Performance:

All tasks were completed as outlined in the Scope of Work for this project.

This project is one of several designed to facilitate the removal of northern pike and smallmouth bass within the Yampa River basin, with an evaluation of the efficiency of such efforts. The study area consisted of the middle Yampa River miles 134.2 to 50.5 which were sampled to capture and remove smallmouth bass and northern pike. In the 2017 sampling season, 236 northern pike individuals were handled and euthanized during electrofishing efforts. Northern pike electrofishing catch rate was 0.43 fish/hour, which was the lowest catch rate observed since intensive, annual electrofishing in the study area began in 2004. Please see the 2017 Final Report for Project #125 for a detailed analysis of smallmouth bass data collected in the study area. Crews also sampled for Colorado pikeminnow, but no fish were collected. Please see the 2017 Final Report for Project #128 for a detailed analysis of Colorado pikeminnow data collected in the study area.