

**RECOVERY PROGRAM  
FY 2016-2017 SCOPE OF WORK for:**

Recovery Program Project Number: 123b

Nonnative Fish Control in the Middle Green River

Reclamation Agreement number: R14AP00007

Reclamation Agreement term: May 1, 2014 – September 30, 2018

Note: Recovery Program FY16-17 scopes of work are drafted in May 2015. They often are revised before final Program approval and may subsequently be revised again in response to changing Program needs. Program participants also recognize the need and allow for some flexibility in scopes of work to accommodate new information (especially in nonnative fish management projects) and changing hydrological conditions.

Lead agency: Utah Division of Wildlife Resources

Submitted by: Robert C. Schelly and Matthew J. Breen  
Utah Division of Wildlife Resources  
Northeast Regional Office  
318 North Vernal Avenue  
Vernal, Utah 84078  
Phone: 435-219-6525; Fax: 435-789-8343  
E-mail: [rschelly@utah.gov](mailto:rschelly@utah.gov)

Date Last Modified: 6/24/2015 4:06:00 PM

Category:

- Ongoing project
- Ongoing-revised project
- Requested new project
- Unsolicited proposal

Expected Funding Source:

- Annual funds
- Capital funds
- Other [*explain*]

I. Title of Proposal: Nonnative Fish Control in the Middle Green River

II. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- III. Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
  - III.A. Reduce negative interactions between nonnative and endangered fishes.
    - III.A.2. Identify and implement viable active control measures.
      - III.A.2.c. Evaluate the effectiveness (e.g., nonnative and native fish response) and develop and implement and integrated, viable active control program.

GREEN RIVER ACTION PLAN: MAINSTEM

- III. Reduce impacts of nonnative fishes and sportfish management activities

- (nonnative and sportfish management).
- III.A. Reduce negative impacts to endangered fishes from sportfish management activities.
  - III.A.4. Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control. Each control activity will be evaluated for effectiveness, and then continued as needed.
    - III.A.4.a. Northern pike in the middle Green River.
    - III.A.4.b. (3) Smallmouth bass in the middle and lower Green River.

### III. Study Background/Rationale and Hypotheses:

The Upper Colorado River Endangered Fish Recovery Program has determined that control of nonnative fish in the upper Colorado River basin is essential to the recovery of the four endangered fish species: Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*). This determination has been documented specifically for Colorado pikeminnow, razorback sucker, and bonytail in nursery habitats and in the mainstem middle Green River in Section 4.3.2 of each species' Recovery Goals document (USFWS 2002).

Smallmouth bass (*Micropterus dolomieu*) abundance has dramatically increased in the Green River since 2000. This increase resulted in a recommendation from the December 2003 Nonnative Fish Control Workshop (Grand Junction, CO) to attempt control of this species in the Green River. Three years of removal, from 2004-2006 and annual Nonnative Fish Control Workshops have added to the knowledge base of the effort required to successfully remove smallmouth bass from the Green River. During the December 2006 workshop, participants discussed the importance of increasing this removal effort and discussed the need for a significant increase to adequately suppress the middle Green River smallmouth bass population. The increased removal effort began in 2007 and will continue through subsequent years. Several adjustments were made in 2012 to increase our effectiveness and efficiency (Skorupski and Breen 2012). During the second full pass, it was apparent that multiple smallmouth bass concentration areas were present, due to a high spawning success under low flow conditions (i.e., Split Mountain and Ouray Refuge sections). Thus, we used an adaptive fisheries management strategy to target "hot spots" maximizing our catches with the funds and time available. Our adjustments were extremely successful, producing high catch rates (>100 fish/hr.) and removing 15,624 smallmouth bass. In the future, full passes will identify concentration areas and remaining effort will be allocated as necessary to maximize removal efficiency within a 16-week period.

Northern pike (*Esox lucius*) are a significant predatory and competitive threat to the endangered fishes and were rated as one of the six nonnative species of greatest concern by experts on the Colorado River native fish assemblage (Hawkins and Nesler 1991). Northern pike became established in the Yampa River in the early 1980's. Originally introduced as game fish in Elkhead Reservoir in 1977, the species escaped and invaded the upper Yampa River and have expanded their number and range within the Yampa and Green rivers (Tyus and Beard 1990). In previous years, there has been evidence of successful spawning in Stewart

Lake near Jensen, Utah and in Old Charlie Wash on the Ouray National Wildlife Refuge (K. Christopherson, Division of Wildlife Northeastern Regional Supervisor, pers. comm.; T. Modde, U.S. Fish and Wildlife Service, Project Leader, pers. comm.). A control program for northern pike in the Yampa River was initiated in 1999 and removal of northern pike in the middle Green River was initiated in 2001. Based on trends in catch rates over subsequent years, removal efforts have been successful at reducing the number of northern pike and maintaining this reduced level in the middle Green River. However, in 2012 more than three times as many northern pike were captured than in 2011 (Skorupski and Breen 2011) and most were in a smaller size class, likely representing age-1 fish. This large age class likely represents a high level of spawning success in 2011. High flows created additional habitat during the spring in the middle Green River, which allowed for a more successful spawning year for northern pike. Future effort will be adaptive to target northern pike in concentration areas during the spring to maximize efficiency, including exploratory removal efforts in areas where northern pike are being reported for the first time.

White sucker (*Catostomus commersoni*) are present in the middle Green River, and their successful reproduction seems less flow-dependent than that of native suckers. For example, in years when native sucker abundance is low, white sucker seem to be just as prevalent. The species is problematic due to its ability to hybridize with native suckers (McDonald et al. 2008) and compete with native suckers for limited resources. In southwestern Missouri, white suckers become mature around 275 mm (Wakefield and Beckman 2005). Because of this, our goal for removing white suckers is to keep the average total length of the white sucker population less than 275 mm. Although 275 mm is the target benchmark, we will evaluate this value in fish collected in subsequent years by dissection and fin ray collection (i.e., age, growth, reproductive status) in the middle Green River. This may not address their ability to compete with native suckers; however, it should limit their ability to hybridize with native catostomids.

At the 2013 Nonnative Fish Workshop, walleye (*Sander vitreus*) were identified as a substantial threat to the recovery of endangered fishes in the upper Colorado River basin, due to increasing densities and the predatory and competitive pressure this species imposes. However, there is currently not a removal program in place that focuses on walleye when they are most vulnerable to capture. Recent observations of increasing densities have mainly come from ancillary captures during Colorado pikeminnow population estimates (project #128), which typically occur earlier in the spring than smallmouth bass removal and in only three out of every five years. Therefore, our future efforts will apply adaptive strategies to target walleye when other projects are not in place for adequate removal efforts. For example, future walleye removal efforts will focus on key spawning temperatures and fluctuations in flow that may allow for maximum effectiveness, as well as targeting concentration areas for walleye (i.e., spawning bars were identified in Dinosaur National Monument in spring 2015).

#### IV. Study Goals, Objectives, End Product(s):

Goal: Sufficiently reduce the abundance of adult smallmouth bass, northern pike, white sucker, and walleye in the middle Green River such that their potential to spawn and their predatory and competitive impacts on the growth, recruitment, and survival of endangered and other

native fishes is minimized.

Objectives:

1. Conduct two smallmouth bass removal passes in the middle Green River from Split Mountain boat ramp to Tabyago Riffle. Full passes will identify concentration areas that will be focused on for the remainder of the field work. Smallmouth bass will be specifically targeted through boat electrofishing (approximately 16 weeks of effort; incidental captures occurring during other projects will also be recorded).
2. Conduct northern pike removal in the middle Green River in concentration areas to maximize efficiency. Northern pike will be targeted specifically in tributary habitats via netting and electrofishing during fluctuating spring flows (~8-10 weeks of effort; incidental captures occurring during other projects will also be recorded).
3. Conduct white sucker removal in the middle Green River to minimize the threat of hybridization with native fishes. White sucker will be targeted specifically in tributary habitats via netting and electrofishing during fluctuating spring flows (~8-10 weeks of effort; incidental captures occurring during other projects will also be recorded).
4. Conduct walleye removal in the mainstem middle Green River using adaptive strategies to target this species when other projects are not in place for adequate removal efforts. Walleye will be targeted in main channel habitats during early spring (~6-8 weeks of effort during off years for project #128, ~2 weeks during on years; incidental captures occurring during other projects will also be recorded).

V. Study Area:

The study area encompasses the middle Green River from Split Mountain boat ramp (RM 319.3) to Tabyago Riffle (RM 206.8). Effort will focus on concentration areas identified during full passes. We will also sample off channel habitats for northern pike and white sucker just prior to and immediately after ice-off to document spawning and remove ripe adults.

VI. Study Methods/Approach:

Temporarily reducing riverine smallmouth bass and northern pike populations appears viable under certain environmental conditions but both species can easily reverse these reductions in population abundance and return to pre-removal abundances under favorable environmental conditions (Breton et al. 2014; Zelasko et al. 2015). Therefore, mechanical removal efforts will attempt to reach eradication of nonnative fish populations in the river. However, recent synthesis reports investigating effectiveness of in-river removal efforts for northern pike and smallmouth bass determined that reducing in-river populations of these two species would not be successful unless in-river reproduction and reservoir escapement were controlled (Breton et al. 2014; Zelasko et al. 2015). Therefore, mechanical removal efforts will continue to temporarily suppress riverine populations, and will focus on reducing in-river reproduction when feasible. Simultaneously, Program partners will work on other means to reduce in-river

reproduction and reservoir escapement, in order to make mechanical removal more effective and to attempt to reach complete eradication of riverine populations.

Smallmouth bass will be removed primarily by electrofishing. Sampling crews will conduct removal activities in a manner that minimizes potential negative impacts to endangered fish. This includes discontinuing electrofishing when elevated numbers of endangered fish are known to be present. Situations when this is likely to occur will be when Colorado pikeminnow are staging in tributary mouths or backwater habitats prior to spawning, when razorback sucker are on or near spawning bars, and following recent stocking of endangered fish. Two electrofishing boats will simultaneously electrofish each shoreline of the river. Electrofishing passes will be conducted when spring peak flows recede below 10,000 cfs. Effort will be focused on shoreline habitat that is likely to contain smallmouth bass. Two full passes will extend from Split Mountain boat ramp to Tabyago Riffle. Effort for the remaining 12 weeks will be allocated to concentration areas identified during complete passes (such as Split Mountain, Ouray National Wildlife Refuge, and below the Duchesne River). Fish lengths and weights will be recorded on each pass. All smallmouth bass will be disposed of on site. All northern pike, white sucker, and walleye collected during smallmouth bass removal will be removed and disposed of as well.

Initial bass removal efforts (i.e., June electrofishing) may serve to identify concentrations of spawning fish. These areas will receive additional electrofishing effort in subsequent passes. If ripe fish or nesting males are encountered, additional effort will be spent at that time to capture other potential spawning or nesting fish in that area. Two methods will be used in an attempt to identify bass spawning periods and locations. First, crews will examine shoreline areas for nests and destroy any found; crews will also examine all bass captured in the first few passes for spawning condition. Further effort may also give an indication as to the presence of young-of-year (YOY) bass. Locations of congregations of YOY bass will be noted and these areas will receive additional electrofishing effort as well in an effort to displace YOY bass.

In addition, smallmouth bass will be removed from Island Park to Rainbow Park in Dinosaur National Monument. In collaboration with USFWS Vernal—CRFP and UDWR—Moab, 2014 served as an initial experiment to conduct a “surge” effort in this reach to maximize nest disturbance during the active spawning period. Three passes per week were conducted in this reach over a three week period (combined efforts of UDWR and Vernal—CRFP). This surge effort will be repeated in 2015.

Known concentration areas for northern pike and white sucker in the middle Green River during spring include: the mouth of Brush Creek (RM 304.5), Cliff Creek (RM 302.9), Stewart Lake Drain (RM 300.0) and Ashley Creek (RM 299.0). These areas will be targeted for removal of northern pike and white sucker. Other main channel habitats (from RM 394 to 381) will be sampled in early spring to target northern pike; specifically, Brown’s Park. This effort includes three separate trips: scouting, electrofishing and fyke net setting, and net pulling. Removal will primarily be completed with the use of fyke nets and raft electrofishing. Sampling methods will be adjusted depending on whether difficulties arise (i.e., otters in the fyke nets, high flows, etc.). We will also evaluate white sucker reproductive maturity because of the limited information on these fish specific to the upper Colorado River basin. All white

suckers over 150 mm will be dissected to observe their reproductive organs. We will determine the sex of each fish and whether they are reproductively mature and ripe at the time of sampling. Based on low success at capturing northern pike in the main channel at Brown’s Park in 2014 and the discovery of a large source population of white suckers in Duck Lakes in Parson’s Unit Waterfowl Management Area (Schelly et al. 2014), removal efforts in Brown’s Park in 2015 will focus on Duck Lakes and sampling of additional off-channel wetlands.

Walleye removal efforts will be an adaptive process using past capture locations to identify concentration areas. Given what we know from past captures, removal efforts will focus on the time period from March until May, with consideration for specific temperatures and flow conditions, as well as for locations where potential spawning bars are located (i.e., Split Mountain reach). Effort will be added in years that do not have Colorado pikeminnow population estimate work ongoing (project 128).

Nonnative removal and evaluation efforts, which includes tagging and marking of endangered and target nonnative fishes, are also being conducted by other researchers and agencies in other reaches of the Green and Yampa Rivers. Therefore, sampling crews will examine all captured endangered and target nonnative fish for tags or marks and record pertinent information. This information will then be reported to pertinent principal investigators and included in annual reporting, and will also be provided to the Recovery Program for submission to the Program’s database.

Besides the targeted smallmouth bass, northern pike, white sucker, and walleye, all nonnative fish encountered during sampling will be removed except for common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), and small-bodied cyprinids. The nonnative fishes that will be removed include, but are not limited to green sunfish (*Lepomis cyanellus*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), gizzard shad (*Dorosoma cepedianum*), and potentially burbot (*Lota lota*). Otolith structures will be collected from specific nonnative species (burbot, walleye, etc.) upon Upper Colorado River Recovery Program request.

All endangered fishes captured during nonnative removal projects will be scanned for a PIT tag, tagged if needed, weighed (g), measured TL (mm), and released alive.

VII. Task Description and Schedule:

Task 1. Northern pike, white sucker, and walleye removal

Task 2. Smallmouth bass removal

Task 3. Data entry, analysis, and reporting

Task	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1			X	X	X							
2						X	X	X	X	X		
3										X	X	X

VIII. Deliverables, Due Dates, and Budget by Fiscal Year:

FY 2016

Task 1. Northern pike, white sucker, and walleye removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	35.48	140	4967.20
Biologist II	33.12	300	9936.00
Journey Maintenance/Construction Specialist	26.66	250	6665.00
Technician II (Field Supervisor)	23.80	480	11424.00
Technician II (Assistant Crew Leader)	17.48	500	8740.00
Technician I	16.23	400	6492.00
Shuttle Drivers	16.58	150	2487.00
		<b>Subtotal</b>	<b>\$50,711</b>
<b>Travel</b>			
3 trucks @ 10% of annual use <sup>a</sup>	20400.00	0.1	2040.00
Per diem (18 day trips x 3 people; 3 overnights x 4 people) (20 day trips x 4 people for walleye removal)	15.14	146	2210.44
		<b>Subtotal</b>	<b>\$4,250</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.00	366	1464.00
Boat oil (quarts)	11.00	24	264.00
Replacement props	150.00	30	4500.00
Fyke nets (Memphis Net & Twine)	900.00	1	900.00
Gillnets/trammel nets (Memphis Net & Twine)	600.00	1	600.00
Electrofishing repair supplies <sup>b</sup>			1000.00
Boat/motor repair and maintenance <sup>c</sup>			1150.00
Sampling equipment <sup>d</sup>			2705.00
Camping supplies <sup>e</sup>			1110.00
		<b>Subtotal</b>	<b>\$13,693</b>
		<b>Task 1 Total</b>	<b>\$68,655</b>

<sup>a</sup>The State of Utah uses Automotive Resources Inc. for motor pool operations. Rental is approximately \$6,800/year/vehicle (includes fleet rental, mileage, and gas), which is based on the average annual cost for all trucks used in our program.

<sup>b</sup>Electrofishing repair supplies include, but are not limited to anode/boom repairs & replacement (\$500), electrofishing safety mats (Tapeswitch-2 @ \$250/each), electrofishing plugs/connectors (\$500), annual electrofisher service (\$500).

<sup>c</sup>Boat/motor repair and maintenance includes, but is not limited to oil filters (15 @ \$20/each), miscellaneous small motor parts/repair (\$500), shop supplies/tools/safety gear (\$500), miscellaneous trailer repairs (\$1000).

<sup>d</sup>Sampling equipment includes, but is not limited to batteries (\$500), waders (Simms-2 @ \$400/each), nets (Cummins-24 @ \$40/each), vials/envelopes/paper/notebooks (Forestry suppliers-\$250), data logger service (Juniper Systems-\$500), sunscreen/bugspray (\$300), first-aid supplies (\$100), water quality meter (YSI-\$800), scale (\$300), GPS unit (Garmin-\$400), livewell/buckets/measuring boards/PIT reader service (\$500).

<sup>e</sup>Camping supplies include, but are not limited to a cooler (NRS-\$450), tents (REI-3 @ \$100/each), sleeping pads (Aire-2 @ \$150), stove (\$200), rolla table (\$90), dry bags (2 @ \$80 & 2 @ \$30), chairs (3 @ \$20/each), cooking utensils & general supplies/propane/toilet supplies (\$500), straps (NRS-\$100).

<sup>b,c,d,e</sup>Estimated costs based on current prices procured from various sources and previous expenditures for items under each category; out years (FY2017 and beyond) include an annual 2% cost of living increase for all categories.

Task 2. Smallmouth bass removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	35.48	100	3548.00
Biologist II	33.12	100	3312.00
Journey Maintenance/Construction Specialist	26.66	1000	26660.00
Technician II (Field Supervisor)	23.80	640	15232.00
Technician II (Assistant Crew Leader)	17.48	320	5593.60
Technician I	16.23	2000	32460.00
Shuttle Drivers	16.58	640	10611.20
		<b>Subtotal</b>	<b>\$97,417</b>
<b>Travel</b>			
3 trucks @ 60% of annual use <sup>a</sup>	20400.00	0.6	12240.00
Per diem (32 day trips; 24 overnights x 4 people)	24.14	224	5407.36
		<b>Subtotal</b>	<b>\$17,647</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.00	1536	6144.00
Boat oil (quarts)	11.00	72	792.00
Replacement water pump/impeller kit	125.00	15	1875.00
Replacement fuel pumps	75.00	2	150.00
Fuel stabilizer	30.00	15	450.00
Oxygen sensor	280.00	2	560.00
Fuel injector	115.00	2	230.00
Steering helm assembly	250.00	2	500.00
Replacement lower units	1300.00	2	2600.00
Replacement gear box/remote assembly	455.00	2	910.00
Lower unit oil (bucket)	160.00	1	160.00
Electrofishing control box (ETS Electrofishing)	6300.00	1	6300.00
Honda generator	2500.00	0	0.00
Honda 50-hp outboard motor	6500.00	1	6500.00
Seasonal housing (monthly rent)	1200.00	9	10800.00
Electrofishing repair supplies <sup>b</sup>			1000.00
Boat/motor repair and maintenance <sup>c</sup>			1150.00
Sampling equipment <sup>d</sup>			2704.00
Camping supplies <sup>e</sup>			1110.00
		<b>Subtotal</b>	<b>\$43,935</b>
		<b>Task 2 Total</b>	<b>\$158,999</b>

Task 3. Data entry, analysis, and reporting

	Rate	Hours/Units	Cost
Labor			
Project Leader	35.48	40	1419.20
Biologist II	33.12	80	2649.60
Technician II (Field Supervisor)	23.80	80	1904.00
Computer fees/year	2861.00	4	11444.00
Phone fees/year	700.00	4	2800.00
		<b>Task 3 Total</b>	<b>\$20,217</b>

**FY 2016 TOTAL \$247,871**

FY 2017

Task 1. Northern pike, white sucker, and walleye removal

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.19	140	5066.54
Biologist II	33.78	300	10134.72
Journey Maintenance/Construction Specialist	27.19	250	6798.30
Technician II (Field Supervisor)	24.28	480	11652.48
Technician II (Assistant Crew Leader)	17.83	500	8914.80
Technician I	16.55	400	6621.84
Shuttle Drivers	16.91	150	2536.74
		<b>Subtotal</b>	<b>\$51,725</b>
Travel			
3 trucks @ 10% of annual use <sup>a</sup>	20808.00	0.1	2080.80
Per diem (18 day trips x 3 people; 3 overnights x 4 people) (20 day trips x 4 people for walleye removal)	20.81	146	3038.26
		<b>Subtotal</b>	<b>\$5,119</b>
Equipment			
Boat fuel (gallons)	4.08	366	1493.28
Boat oil (quarts)	11.22	24	269.28
Replacement props	153.00	30	4590.00
Fyke nets (Memphis Net & Twine)	918.00	1	918.00
Gillnets/trammel nets (Memphis Net & Twine)	612.00	2	1224.00
Electrofishing repair supplies <sup>b</sup>			1020.00
Boat/motor repair and maintenance <sup>c</sup>			1173.00
Sampling equipment <sup>d</sup>			2759.10
Camping supplies <sup>e</sup>			1132.20
		<b>Subtotal</b>	<b>\$14,579</b>
		<b>Task 1 Total</b>	<b>\$71,423</b>

Task 2. Smallmouth bass removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	36.19	100	3618.96
Biologist II	33.78	100	3378.24
Journey Maintenance/Construction Specialist	27.19	1000	27193.20
Technician II (Field Supervisor)	24.28	640	15536.64
Technician II (Assistant Crew Leader)	17.83	320	5705.47
Technician I	16.55	2000	33109.20
Shuttle Drivers	16.91	640	10823.42
		<b>Subtotal</b>	<b>\$99,365</b>
<b>Travel</b>			
3 trucks @ 60% of annual use <sup>a</sup>	20808.00	0.6	12484.80
Per diem (32 day trips; 24 overnights x 4 people)	24.62	224	5515.51
		<b>Subtotal</b>	<b>\$18,000</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.08	1536	6266.88
Boat oil (quarts)	11.22	72	807.84
Replacement water pump/impeller kit	127.50	15	1912.50
Replacement fuel pumps	76.50	2	153.00
Fuel stabilizer	30.60	15	459.00
Oxygen sensor	285.60	2	571.20
Fuel injector	117.30	2	234.60
Steering helm assembly	255.00	2	510.00
Replacement lower units	1326.00	2	2652.00
Replacement gear box/remote assembly	464.10	2	928.20
Lower unit oil (bucket)	163.20	1	163.20
Electrofishing control box (ETS Electrofishing)	6426.00	0	0.00
Honda generator	2550.00	2	5100.00
Honda 50-hp outboard motor	6630.00	1	6630.00
Seasonal housing (monthly rent)	1224.00	9	11016.00
Electrofishing repair supplies <sup>b</sup>			1000.00
Boat/motor repair and maintenance <sup>c</sup>			1173.00
Sampling equipment <sup>d</sup>			2711.00
Camping supplies <sup>e</sup>			1132.20
		<b>Subtotal</b>	<b>\$43,421</b>
		<b>Task 2 Total</b>	<b>\$160,786</b>

Task 3. Data entry, analysis, and reporting

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.19	40	1447.58
Biologist II	33.78	80	2702.59
Technician II (Field Supervisor)	24.28	80	1942.08
Computer fees/year	2918.22	4	11672.88
Phone fees/year	714.00	4	2856.00
		<b>Task 3 Total</b>	<b>\$20,621</b>

**FY 2017 TOTAL \$252,831**

FY 2018

Task 1. Northern pike, white sucker, and walleye removal

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.91	140	5167.87
Biologist II	34.46	300	10337.41
Journey Maintenance/Construction Specialist	27.74	250	6934.27
Technician II (Field Supervisor)	24.76	480	11885.53
Technician II (Assistant Crew Leader)	18.19	500	9093.10
Technician I	16.89	400	6754.28
Shuttle Drivers	17.25	150	2587.47
		<b>Subtotal</b>	<b>\$52,760</b>
Travel			
3 trucks @ 10% of annual use <sup>a</sup>	21224.16	0.1	2122.42
Per diem (18 day trips x 3 people; 3 overnights x 4 people) (20 day trips x 4 people for walleye removal)	21.23	146	3099.03
		<b>Subtotal</b>	<b>\$5,221</b>
Equipment			
Boat fuel (gallons)	4.16	366	1523.15
Boat oil (quarts)	11.44	24	274.67
Replacement props	156.06	30	4681.80
Fyke nets (Memphis Net & Twine)	936.36	0	0.00
Gillnets/trammel nets (Memphis Net & Twine)	624.24	1	624.24
Electrofishing repair supplies <sup>b</sup>			1040.40
Boat/motor repair and maintenance <sup>c</sup>			1196.46
Sampling equipment <sup>d</sup>			2814.28
Camping supplies <sup>e</sup>			1154.84
		<b>Subtotal</b>	<b>\$13,310</b>
		<b>Task 1 Total</b>	<b>\$71,291</b>

Task 2. Smallmouth bass removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	36.91	100	3691.34
Biologist II	34.46	100	3445.80
Journey Maintenance/Construction Specialist	27.74	1000	27737.06
Technician II (Field Supervisor)	24.76	640	15847.37
Technician II (Assistant Crew Leader)	18.19	320	5819.58
Technician I	16.89	2000	33771.38
Shuttle Drivers	17.25	640	11039.89
		<b>Subtotal</b>	<b>\$101,352</b>
<b>Travel</b>			
3 trucks @ 60% of annual use <sup>a</sup>	21224.16	0.6	12734.50
Per diem (32 day trips; 24 overnights x 4 people)	25.12	224	5625.82
		<b>Subtotal</b>	<b>\$18,360</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.16	1536	6392.22
Boat oil (quarts)	11.44	72	824.00
Replacement water pump/impeller kit	130.05	15	1950.75
Replacement fuel pumps	78.03	2	156.06
Fuel stabilizer	31.21	15	468.18
Oxygen sensor	291.31	2	582.62
Fuel injector	119.65	2	239.29
Steering helm assembly	260.10	2	520.20
Replacement lower units	1352.52	2	2705.04
Replacement gear box/remote assembly	473.38	2	946.76
Lower unit oil (bucket)	166.46	1	166.46
Electrofishing control box (ETS Electrofishing)	6554.52	1	6554.52
Honda generator	2601.00	0	0.00
Honda 50-hp outboard motor	6762.60	1	6762.60
Seasonal housing (monthly rent)	1248.48	9	11236.32
Electrofishing repair supplies <sup>b</sup>			1020.00
Boat/motor repair and maintenance <sup>c</sup>			1196.46
Sampling equipment <sup>d</sup>			2859.00
Camping supplies <sup>e</sup>			1154.84
		<b>Subtotal</b>	<b>\$45,849</b>
		<b>Task 2 Total</b>	<b>\$165,562</b>

Task 3. Data entry, analysis, and reporting

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.91	40	1476.54
Biologist II	34.46	80	2756.64
Technician II (Field Supervisor)	24.76	80	1980.92
Computer fees/year	2976.58	4	11906.34
Phone fees/year	728.28	4	2913.12
		<b>Task 3 Total</b>	<b>\$21,034</b>

**FY 2018 TOTAL \$257,887**

FY 2019

Task 1. Northern pike, white sucker, and walleye removal

	Rate	Hours/Units	Cost
Labor			
Project Leader	37.65	140	5271.23
Biologist II	35.15	300	10544.16
Journey Maintenance/Construction Specialist	28.29	250	7072.95
Technician II (Field Supervisor)	25.26	480	12123.24
Technician II (Assistant Crew Leader)	18.55	500	9274.96
Technician I	17.22	400	6889.36
Shuttle Drivers	17.59	150	2639.22
		<b>Subtotal</b>	<b>\$53,815</b>
Travel			
3 trucks @ 10% of annual use <sup>a</sup>	21648.64	0.1	2164.86
Per diem (18 day trips x 3 people; 3 overnights x 4 people) (20 day trips x 4 people for walleye removal)	21.65	146	3161.01
		<b>Subtotal</b>	<b>\$5,326</b>
Equipment			
Boat fuel (gallons)	4.24	366	1553.61
Boat oil (quarts)	11.67	24	280.16
Replacement props	159.18	30	4775.44
Fyke nets (Memphis Net & Twine)	955.09	1	955.09
Gillnets/trammel nets (Memphis Net & Twine)	636.72	2	1273.45
Electrofishing repair supplies <sup>b</sup>			1061.21
Boat/motor repair and maintenance <sup>c</sup>			1220.39
Sampling equipment <sup>d</sup>			2987.00
Camping supplies <sup>e</sup>			1177.94
		<b>Subtotal</b>	<b>\$15,284</b>
		<b>Task 1 Total</b>	<b>\$74,425</b>

Task 2. Smallmouth bass removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	37.65	100	3765.17
Biologist II	35.15	100	3514.72
Journey Maintenance/Construction Specialist	28.29	1000	28291.81
Technician II (Field Supervisor)	25.26	640	16164.32
Technician II (Assistant Crew Leader)	18.55	320	5935.97
Technician I	17.22	2000	34446.81
Shuttle Drivers	17.59	640	11260.69
		<b>Subtotal</b>	<b>\$103,379</b>
<b>Travel</b>			
3 trucks @ 60% of annual use <sup>a</sup>	21648.64	0.6	12989.19
Per diem (32 day trips; 24 overnights x 4 people)	25.62	224	5738.33
		<b>Subtotal</b>	<b>\$18,728</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.24	1536	6520.06
Boat oil (quarts)	11.67	72	840.48
Replacement water pump/impeller kit	132.65	15	1989.77
Replacement fuel pumps	79.59	2	159.18
Fuel stabilizer	31.84	15	477.54
Oxygen sensor	297.14	2	594.28
Fuel injector	122.04	2	244.08
Steering helm assembly	265.30	2	530.60
Replacement lower units	1379.57	2	2759.14
Replacement gear box/remote assembly	482.85	2	965.70
Lower unit oil (bucket)	169.79	1	169.79
Electrofishing control box (ETS Electrofishing)	6685.61	0	0.00
Honda generator	2653.02	2	5306.04
Honda 50-hp outboard motor	6897.85	1	6897.85
Seasonal housing (monthly rent)	1273.45	9	11461.05
Electrofishing repair supplies <sup>b</sup>			1040.40
Boat/motor repair and maintenance <sup>c</sup>			1220.39
Sampling equipment <sup>d</sup>			2704.00
Camping supplies <sup>e</sup>			1177.94
		<b>Subtotal</b>	<b>\$45,058</b>
		<b>Task 2 Total</b>	<b>\$167,165</b>

Task 3. Data entry, analysis, and reporting

	Rate	Hours/Units	Cost
Labor			
Project Leader	37.65	40	1506.07
Biologist II	35.15	80	2811.78
Technician II (Field Supervisor)	25.26	80	2020.54
Computer fees/year	3036.12	4	12144.46
Phone fees/year	742.85	4	2971.38
		<b>Task 3 Total</b>	<b>\$21,454</b>

**FY 2019 TOTAL \$263,045**

FY 2020

Task 1. Northern pike, white sucker, and walleye removal

	Rate	Hours/Units	Cost
Labor			
Project Leader	38.40	140	5376.66
Biologist II	35.85	300	10755.05
Journey Maintenance/Construction Specialist	28.86	250	7214.41
Technician II (Field Supervisor)	25.76	480	12365.70
Technician II (Assistant Crew Leader)	18.92	500	9460.46
Technician I	17.57	400	7027.15
Shuttle Drivers	17.95	150	2692.01
		<b>Subtotal</b>	<b>\$54,891</b>
Travel			
3 trucks @ 10% of annual use <sup>a</sup>	22081.62	0.1	2208.16
Per diem (18 day trips x 3 people; 3 overnights x 4 people) (20 day trips x 4 people for walleye removal)	22.08	146	3224.23
		<b>Subtotal</b>	<b>\$5,432</b>
Equipment			
Boat fuel (gallons)	4.33	366	1584.68
Boat oil (quarts)	11.91	24	285.76
Replacement props	162.36	30	4870.94
Fyke nets (Memphis Net & Twine)	974.19	1	974.19
Gillnets/trammel nets (Memphis Net & Twine)	649.46	0	0.00
Electrofishing repair supplies <sup>b</sup>			1082.43
Boat/motor repair and maintenance <sup>c</sup>			1244.80
Sampling equipment <sup>d</sup>			2927.98
Camping supplies <sup>e</sup>			1201.50
		<b>Subtotal</b>	<b>\$14,291</b>
		<b>Task 1 Total</b>	<b>\$74,615</b>

Task 2. Smallmouth bass removal

	Rate	Hours/Units	Cost
<b>Labor</b>			
Project Leader	38.40	100	3840.47
Biologist II	35.85	100	3585.02
Journey Maintenance/Construction Specialist	28.86	1000	28857.64
Technician II (Field Supervisor)	25.76	640	16487.61
Technician II (Assistant Crew Leader)	18.92	320	6054.69
Technician I	17.57	2000	35135.75
Shuttle Drivers	17.95	640	11485.90
		<b>Subtotal</b>	<b>\$105,447</b>
<b>Travel</b>			
3 trucks @ 60% of annual use <sup>a</sup>	22081.62	0.6	13248.97
Per diem (32 day trips; 24 overnights x 4 people)	26.13	224	5853.10
		<b>Subtotal</b>	<b>\$19,102</b>
<b>Equipment</b>			
Boat fuel (gallons)	4.33	1536	6650.46
Boat oil (quarts)	11.91	72	857.29
Replacement water pump/impeller kit	135.30	15	2029.56
Replacement fuel pumps	81.18	2	162.36
Fuel stabilizer	32.47	15	487.09
Oxygen sensor	303.08	2	606.16
Fuel injector	124.48	2	248.96
Steering helm assembly	270.61	2	541.22
Replacement lower units	1407.16	2	2814.32
Replacement gear box/remote assembly	492.51	2	985.01
Lower unit oil (bucket)	173.19	1	173.19
Electrofishing control box (ETS Electrofishing)	6819.32	1	6819.32
Honda generator	2706.08	0	0.00
Honda 50-hp outboard motor	7035.81	1	7035.81
Seasonal housing (monthly rent)	1298.92	9	11690.27
Electrofishing repair supplies <sup>b</sup>			1061.21
Boat/motor repair and maintenance <sup>c</sup>			1244.80
Sampling equipment <sup>d</sup>			2650.00
Camping supplies <sup>e</sup>			1201.50
		<b>Subtotal</b>	<b>\$47,259</b>
		<b>Task 2 Total</b>	<b>\$171,808</b>

Task 3. Data entry, analysis, and reporting

	Rate	Hours/Units	Cost
Labor			
Project Leader	38.40	40	1536.19
Biologist II	35.85	80	2868.01
Technician II (Field Supervisor)	25.76	80	2060.95
Computer fees/year	3096.84	4	12387.35
Phone fees/year	757.70	4	3030.81
		<b>Task 3 Total</b>	<b>\$21,883</b>
			<b>FY 2020 TOTAL \$268,306</b>

IX. Budget Summary:

FY 2016	\$247,871
FY 2017	\$252,831
FY 2018	\$257,887
FY 2019	\$263,045
FY 2020	\$268,306
<b>TOTAL</b>	<b>\$1,289,939</b>

X. Reviewers: **Kevin McAbee, June 2015;**

XI. References:

Hawkins, J.A. and T.P. Nesler. 1991. Nonnative fishes of the upper Colorado River Basin: an issue paper. Final Report of Colorado State University Larval Fish Laboratory to the Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

McDonald, D.B., T.L. Parchman, M.R. Bower, W.A. Hubert, and F.J. Rahel. 2008. An introduced and a native vertebrate hybridize to form a genetic Bridge to a second native species. Proceedings of the National Academy of the Sciences of the USA 105:10837–10842.

Schelly, R.C., A.M. Boehm, and M.J. Breen. 2014. Nonnative fish control in the middle Green River. Annual Report submitted to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Skorupski, J.A. and M.J. Breen. 2011. Nonnative fish control in the middle Green River. Annual Report submitted to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Skorupski, J.A. and M.J. Breen. 2012. Nonnative fish control in the middle Green River.

Annual Report submitted to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Tyus, H.M. and J.M. Beard. 1990. *Esox lucius* (Esocidae) and *Stizostedion vitreum* (Percidae) in the Green River basin, Colorado and Utah. *Great Basin Naturalist* 50(1): 33-39.

U.S. Fish and Wildlife Service. 2002. Colorado pikeminnow (*Ptychocheilus lucius*) recovery goals: amendment and supplement to the humpback chub recovery plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

U.S. Fish and Wildlife Service. 2002. Razorback sucker (*Xyrauchen texanus*) recovery goals: amendment and supplement to the humpback chub recovery plan.

U.S. Fish and Wildlife Service. 2002. Bonytail (*Gila elegans*) recovery goals: amendment and supplement to the humpback chub recovery plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

Wakefield, C.K. and D.W. Beckman. 2005. Life history attributes of white sucker (*Catostomus commersonii*) in Lake Taneycomo and associated tributaries in southwestern Missouri. *The Southwestern Naturalist* 50:423-434.