

**RECOVERY PROGRAM**  
**FY 2020-2021 SCOPE OF WORK for:**  
*Nonnative fish control in the Green River*

Recovery Program Project Number: 123a

Reclamation Agreement number: (UDWR - R19AP00059) (GRBFWCO - ??)

Reclamation Agreement term: Oct. 1, 2019 – Sept. 30, 2024

Note: Recovery Program FY20-21 scopes of work are drafted in May 2019. 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: USFWS

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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 Green River, Dinosaur National Monument, and Desolation/Gray Canyons.
- II. Relationship to RIPRAP:  
GREEN RIVER ACTION PLAN: MAINSTEM  
III. Reduce impacts of nonnative fishes  
III.A.4. Develop and implement control programs for nonnative fishes  
III.A.4.b.(3) Smallmouth bass in middle and lower Green River  
III.A.4.d. Walleye in the middle and lower Green River  
III.A.4.g. Other emerging nonnative fishes
- III. Study Background/Rationale and Hypotheses:  
The Upper Colorado River Endangered Fish Recovery Program has determined that control of nonnative fishes in the upper Colorado River basin is essential to the recovery of the four endangered fish species: Colorado pikeminnow, razorback sucker, humpback chub, and

bonytail. Smallmouth bass abundance increased dramatically in the Green River after 2000, and control efforts for this species commenced in 2004. Based on data collected each year, investigators and the Recovery Program have modified this project in an effort to adapt to new insights and population dynamics. In particular, efforts have been focused on targeting adult smallmouth bass as they spawn, in an attempt to both remove large adults and reduce reproduction. In 2012 and 2013, dry conditions and low river discharge resulted in a large group of sub-adult fish in the Echo-Split reach. Crews noted higher abundances of age-0 bass in the Island Park area during these years, suggesting this may be a spawning reach. This was confirmed in 2016 by additional captures of large adults and young of year, in addition to the capture of recently hatched bass on a nest. Except during the low water year of 2018 when UDWR Vernal could not access Island Park with john boats, passes through Island Park have been coordinated between UDWR in Vernal and Moab, as well as FWS Vernal, in order to maximize removal during the period when bass were likely spawning since 2014. This approach has resulted in improved allocation of effort to maximize captures during this period. Catch rates for adults in this focal reach are higher during this time than for the rest of the season. Bass will also be tagged in order to estimate population abundance, track movement, and monitor the effectiveness of control passes. Smallmouth bass will only be marked on one pass and will be removed on all subsequent passes.

In 2008, two control/monitoring trips were completed to assess smallmouth abundance and distribution within Desolation/Gray Canyons. The 2008 assessment showed relative abundance remained low and that although distribution had spread downstream, 85% of bass captured were within the first 40 miles of the reach, similar to patterns seen in 2006. Intensive control efforts in this reach were deemed unnecessary at that time. Reports of increasing smallmouth bass captures in the uppermost section of Desolation Canyon led to renewed sampling efforts in 2011 and 2012 which resulted in overall catch rates similar to previous years; however, bass were present further downstream compared to the 2004-2006 period. No sampling occurred as part of this project in Desolation Canyon in 2013, however 295 smallmouth bass were caught during three Project 128 (Colorado pikeminnow population estimate) passes, which was an over three-fold increase from 2012 targeted removal efforts. Two targeted bass removal passes were completed in 2014 which produced a four-fold increase of overall catch rate of bass from 2012 levels (2012 CPUE= 4 fish/hour versus 2014 CPUE= 16 fish/hour). While the catch rate of adult bass doubled, the four-fold increase in overall catch rate was attributed to an increase of juvenile bass (TL=100-199 mm) captured. These juveniles were produced during the low water years of 2012 and 2013; in 2014 these cohorts were seen in large numbers in most reaches where bass removal was occurring. Not only did the abundance of bass increase during 2014 sampling, but the distribution of bass also expanded downstream to include the entire 80-mile reach, with large numbers of fish seen below the areas commonly occupied in earlier surveys. Targeted smallmouth bass surveys show that smallmouth continue to be found throughout the reach. However, catch rates from 2015 – 2018 has been much lower than 2014. Size structure data suggest that smallmouth bass recruitment has been limited since 2014 but indicate the continued presence of cohort(s) first identified in 2014. Crews will continue to remove bass and monitor this reach with two passes annually. However, this task may be adjusted to more or less effort depending upon hydrologic conditions. For example, effort may be reduced to one pass (and effort shifted upstream to the Echo/Split reach) in years when

Project #128 is occurring or when the smallmouth bass threat is naturally suppressed by the seasonal flow regime. In years when river conditions are conducive to bass spawning, such as 2012, more effort may be applied to the reach.

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

Goal: Control and monitor abundance of smallmouth bass and other nonnative fishes in the Green River between Echo Park and Split Mountain boat ramp, and Desolation and Gray Canyons

Objectives:

1. Remove smallmouth bass and other nonnative fishes in the Green River from Echo Park (RM 344.5) to Split Mountain (RM 319.5) and in Desolation/Gray Canyons from Tabyago Riffle to Swasey's boat ramp (RM 207-129.8).
2. Monitor adult and juvenile smallmouth bass to determine extent of control needed in the Green River, including marking and recapturing bass in the Echo-Split reach.

End Products: Annual reports will provide the current year's data for: adult and juvenile total CPUE, CPUE by river mile and size class, monthly length frequency histograms, CPUE for other nonnative species, total catch numbers, and estimates of spawning periods and locations. Population abundances of smallmouth bass will be estimated using tag and recapture data from Echo-Split. Data from past years will be included for relevant metrics to provide background and demonstrate trends.

V. Study Area:

- a. Green River within Dinosaur National Monument from Echo Park to Split Mountain boat ramp (RM 344.5-319.5), June-September
- b. Desolation/Gray Canyons from Tabyago Riffle to Swasey's boat ramp (RM 207-129.8), June-August

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 removal efforts will begin after runoff has subsided on the Yampa River and Larval Trigger flows in the Green River are reduced. Initiation of field work will also occur after mean water temperature approaches 16° C at the USGS Green River at Jensen gage, the temperature at which smallmouth bass are likely spawning period (Breton et al. 2015). If conditions permit, the initial pass will focus on known spawning locations in upper Island Park. A Lincoln-Peterson mark recapture estimate will be completed to estimate smallmouth bass population size wherein all bass will be marked with Floy tags and released during a mid-season pass. Marked fish caught during subsequent passes will then be used to generate the population estimate. Except for tagged fish caught during the marking pass, all smallmouth bass, walleye, northern pike, white sucker and white sucker hybrids, green sunfish, black crappie, white crappie, creek chub, and burbot caught will be removed.

Green River Basin FWCO (GRBFWCO) and Utah Division of Wildlife Resources Moab (UDWRM) will collaboratively conduct one marking pass and 11 removal passes from Echo Park to the Split Mountain boat ramp, with each pass comprising three days of field work. Additionally, UDWRM will conduct two 7-day removal passes from Tabyago Riffle to the Swasey’s boat ramp.

VII. Task Description and Schedule:

Task 1. Eight removal passes from Echo Park to Split Mountain boat ramp (USFWS GRBFWCO – Vernal; July-September).

Task 2. One marking and three removal passes from Echo Park to Split Mountain boat ramp (UDWR Moab; June - August).

Task 3. Two removal passes in Desolation and Gray Canyons (UDWR Moab; June-August).

Task 4. Data entry, analysis, and reporting – October-December

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1						X	X	X	X			
2						X	X	X				
3						X	X	X				
4										X	X	X

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

	<b>Deliverable</b>	<b>Due Date</b>
FY 2020	Annual Report	November 2020
FY 2021	Annual Report	November 2021
FY 2022	Annual Report	November 2022
FY 2023	Annual Report	November 2023
FY 2024	Annual Report	November 2024

IX. Budget Summary:

	<b>UDWR-Moab</b>	<b>USFWS-Vernal</b>	<b>FY Total</b>
FY 2020	\$ 86,921	\$ 114,326	\$201,247
FY 2021	\$ 88,660	\$ 109,593	\$198,253
FY 2022	\$ 90,433	\$ 111,826	\$202,259
FY 2023	\$ 92,242	\$ 114,145	\$206,387
FY 2024	\$ 94,086	\$ 127,317	\$221,403
<b>TOTAL</b>	<b>\$ 452,342</b>	<b>\$ 577,207</b>	<b>\$ 1,029,549</b>

X. Reviewers:

XI. References:

Breton, A. R, D. L. Winkelman, J. A. Hawkins, and K. R. Bestgen. 2014. Population trends of smallmouth bass in the upper Colorado River basin with an evaluation of removal effects. Final report to the Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado. Larval Fish Laboratory Contribution 169.

Breton, A.R., D.L. Winkelman, K.R. Bestgen, and J.A. Hawkins. 2015. Population dynamics modeling of introduced smallmouth bass in the upper Colorado River basin. Final report to the Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado. Larval Fish Laboratory Contribution 161.

Zelasko, K. A., K. R. Bestgen, J. A. Hawkins, G. C. White. 2014. Abundance and population dynamics of invasive northern pike *Esox lucius*, Yampa River, Colorado, 2004–2010. Final Project # 123a-SMB Echo-Split/Desolation-Gray FY 2018-2019 SOW, Page 20 Report to the Upper Colorado River Endangered Fish Recovery Program, Project 161b, Denver. Larval Fish Laboratory Contribution 185.