

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

Recovery Program Project Number: 158

Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats 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.

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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:

Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats 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. Implement and evaluate the effectiveness of viable active control measures.
- III.A.2.f. Develop control program for removal of small nonnative cyprinids in backwaters and other low velocity habitats.

GREEN RIVER ACTION PLAN: MAINSTEM

- III. Reduce impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
- 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.
- III.A.4.b. Nonnative cyprinids and centrarchids in nursery habitats.
- III.A.4.b.(1) Small nonnative cyprinids from backwaters and other low velocity Habitats in the lower Green River

III. Study Background/Rationale and Hypotheses:

Fall Interagency Standardized Monitoring Program (ISMP) sampling of age-0 Colorado pikeminnow (CPM) has been conducted annually since the mid-1980s to assess the abundance and distribution of young fish. Since 1994, these surveys have shown a reduction in the abundance of age-0 CPM in the alluvial section of the Green River between Split Mountain and Desolation Canyon (Breen et al. 2011). Other studies monitoring the upstream abundance of larval CPM drifting from the Yampa Canyon spawning site during the same time suggest that larval fish production has not decreased from previous levels when age-0 CPM were more abundant in this reach (Bestgen et al. 1998; Bestgen and Hill, In Review). Several possibilities exist for why age-0 CPM are not being caught as frequently as they once were, including an increase in nonnative predatory fishes, nonnative competitors, and habitat changes. Other researchers have been, or are currently, investigating environmental conditions such as changes in habitat related to flow and temperature. This study seeks to monitor the arrival and entrainment of larval CPM into backwaters in this reach and investigate the possible influence nonnative fishes may have on age-0 CPM as they arrive and grow in backwater habitats.

Preliminary data from 2009-2010 and 2012 are being analyzed and will be summarized in a final report (due February 2016). Early analyses have allowed us to estimate transport abundances for the Split Mountain drift net site and compare those to the Echo Park site upstream. These data have confirmed that Colorado pikeminnow larvae are arriving in the nursery reach. We have also been able to document larvae arriving in backwater habitats, successfully deplete those areas of nonnative fish ($\geq 90\%$) before implementing a variety of blocking treatments, and track the occupancy of those habitats through the summer. Continuing this work in future years will build a more robust dataset, allowing for comparisons across years with different hydrologic regimes. More specifically, in the previous years with hydrology that favored pikeminnow recruitment (2009-2010), this was essentially a pilot

project. Numerous changes then led to a better experimental design (allowing for statistical comparisons among treatments) that was implemented in 2012. Unfortunately, 2012 was a dry year with poor recruitment.

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

Goal:

Increase survival and growth of larval CPM in middle Green River backwaters via reduction of nonnative fishes.

Objectives:

1. Estimate transport abundance of CPM larvae arriving at the upstream extent of the nursery reach (Split Mtn. drift site).
2. Document abundance of larval CPM in backwaters as the season progresses.
3. Reduce densities of nonnative fish, particularly cyprinids, in backwater habitats before and after arrival of CPM larvae.
4. Determine success of manipulating backwaters to increase CPM larval survival in backwaters from Red Wash to the Ouray Refuge by removing and excluding nonnative fish followed by the use of various blocking treatments.
5. Assess small-bodied fish community effects from removing nonnative fishes from backwaters.

End Product:

1. Documentation of relative abundance of larval CPM spawned in the Yampa River arriving in the Ouray reach.
2. Expected persistence time of larval CPM without any treatment.
3. Determination of whether blocking backwaters depleted of nonnatives is a successful method for increasing the survival and growth of larval CPM in the Ouray reach of the middle Green River.

V. Study Area:

The study area encompasses the middle Green River from Red Wash boat ramp (RM 298.1) to the Duchesne River confluence (RM 247.9).

VI. Study Methods/Approach:

Our first focus will be to determine the abundance of larval CPM drifting into the study reach and arriving in backwater habitats. This will be accomplished by drift netting above the Jensen area and seining all backwaters along the Ouray National Wildlife Refuge and selected backwaters from Red Wash to the Duchesne River. We will not sample backwaters selected for manipulation (see below), as they will be intensively sampled during nonnative control and monitoring. Drift net sampling will be initiated at the Split Mountain boat ramp/campground area within twenty-four hours after CSU Larval Fish Lab field sampling indicates a pulse of

CPM larval drift at Echo Park. Previous work indicated that there is approximately a one day lag time between pulses of larvae at Echo Park and Split Mountain in low discharge years (Bestgen et al. 1998). Sampling will be targeted at times of higher drift and coordinated with LFL personnel. Previous work showed that samples collected in the two sites were most consistent with one another when more larvae were available and the sites were sampled during the same pulse event (Bestgen et al. 1998). We will also attempt to coordinate drift net activities with turbidity events detected by the LFL site upstream. We propose more limited drift net collections than the Echo Park site because our objective is only to confirm arrival of larval drift at Split Mountain in similar numbers as in Echo Park. The Echo Park site will still document extent and timing of the entire drift period, whereas the Split Mountain site will confirm that those drift events are continuing downstream and in similar numbers. One drawback to the methodology proposed for Split Mountain will be the possibility of missing drift events if the larvae are present at lower densities over a longer time. This has been observed in years with lower flow and less turbidity.

The sampling design will duplicate that of LFL, namely three nets will be set near shore for 1-2 hours daily at dawn. Nets will be attached to steel frames and deployed in water 0.5-1 m in depth. Flow meters in the net mouth and deployment times will be used to compute the volume of water sampled. Samples will be preserved in ethanol and placed in containers for later sample identification, measurement for length, and enumeration, by both USFWS and LFL.

The other aspect of monitoring will be seining backwaters at Ouray National Wildlife Refuge during late July and early August. This will be done to gather data comparable to that collected from 1990-1996 (Day et al. 1999). All backwaters will be seined on Ouray National Wildlife Refuge, along with reference backwaters used in Argonne National Laboratory's ongoing work, and selected backwaters from Red Wash to the confluence with the Duchesne River, as feasible. The goal of the Ouray sampling is to collect data that can be used to compare larval densities to previous studies conducted during years with higher CPM recruitment. The Argonne backwaters will be sampled to further refine and verify backwater models as they relate to CPM entrainment; the other backwaters will be sampled to increase the odds in detecting the presence of larvae. As mentioned previously, backwaters targeted for nonnative depletions will not be sampled during this portion of the work. Six backwaters within the Red Wash to Duchesne River reach have been identified for this purpose. Seine hauls will be taken at three transects perpendicular to the axis of the backwater, similar to ISMP sampling. For small backwaters, the entire backwater will be seined. Deep backwaters will be seined parallel to shore. The work by Day et al. (1999) sampled as many as 84 backwaters on the Ouray NWR using this methodology. Depending on overall total length and ability to verify species at sampling time, larval CPM will be identified and released, if possible, or preserved in ethanol for identification in Vernal, and subsequently sent to the Larval Fish Lab for verification. If field crews encounter abundant, putative larval CPM the sampling protocol may be adjusted to minimize larval mortality (as was the case in 2010). Backwater habitat measurements and metrics for catch per effort will also be collected after seining to prevent disturbing fish. The objective of this sampling regime is to verify larval CPM are arriving in nursery habitats in numbers comparable to past data from the 1980s-early 1990s and comparable to drift samples upstream in Echo Park. Data currently being collected involves the early stages of drift and fall juvenile counts, and these data indicate there

continues to be low recruitment of individuals from the time of drift into fall. If numbers of larvae arriving have declined, determining the point of loss will involve investigating mortality upstream during drift from Echo Park to Split Mountain. Comparable numbers of larvae in this study reach to numbers observed in upper study reaches will allow us to focus efforts on mortality in nursery habitats, after the drift.

The second component of this project is to reduce nonnative fish abundance in nursery habitats to determine the effect on larval CPM survival. Several key results were apparent from our 2010 data that warrant changes to this portion of our study. Observations were as follows: (1) fish community composition was similar for each of three backwater treatment types, primarily consisting of red shiners, sand shiners, and fathead minnows; (2) we observed more carp in control backwaters, suggesting that we were successful at excluding larger fish with blocking treatments; (3) small-bodied nonnative cyprinids were more abundant in blocked backwaters than controls; (4) the study design was not robust enough to test for statistical differences in backwater blocking treatments and their effect on the survival of age-0 CPM. Following initial depletions, control backwaters contained a total of 1100 fishes, the backwaters blocked by the ½ inch mesh block nets had 1,761 fish and the backwaters blocked by the ¼ inch mesh block nets had 5,065 fish. Three hypotheses may explain an increase in nonnatives with increased exclusion: (1) our initial depletion efforts were not 100% effective at removing cyprinids, (2) immigration of nonnative fish into blocked backwaters occurred through our nets, and (3) smaller cyprinids that passed through our nets were more successful with the exclusion of larger predators. It appears that smaller fish are surviving in the backwaters blocked by the smallest mesh size because there is a lack of predation in these backwaters. Finally, as the level of exclusion increases, larval CPM abundance also increased. In the control backwaters, mean CPM abundance was 0.8 ± 0.37 , in the backwaters blocked by the ½ inch mesh block nets, mean CPM abundance was 1.4 ± 1.4 , and in the backwaters blocked by the ¼ inch mesh block nets, mean CPM abundance was 9.2 ± 4.04 . This suggests that by blocking backwaters, we are increasing YOY CPM survival by decreasing predation from larger fish. In 2012, the study was repeated with a robust study design (i.e., sufficient replicate backwaters of each treatment) to effectively measure depletion, monitor the fish community temporally and measure survival of age-0 CPM. Results demonstrated all backwaters were successfully depleted by 90-99% and numbers remained suppressed for 1.5 months in the three treatments. Also, as observed in 2010, the sizes of small-bodied cyprinids were differential among treatments for the 1.5 months abundance was suppressed. The smallest individuals were in ¼ inch, larger in ½ inch and largest in control backwaters (Skorupski et al. 2012). Although 2012 demonstrated backwaters can be successfully depleted and blocking backwaters can reduce the size of cyprinids for 1.5 months, the survival of age-0 CPM could not be evaluated because larval abundance was limited due to drought conditions. This demonstrates the importance of conducting the project over multiple flow regimes to effectively determine if blocking backwaters is successful by improving the survival of age-0 CPM.

Backwaters for this portion of the study will include three treatments, all of which will be initially depleted of nonnatives: (1) four control backwaters that will not be blocked after initial depletions; (2) four backwaters blocked by ½ inch mesh nets; and (3) four backwaters that are blocked by a ¼ inch mesh nets. Blocking will be accomplished using ¼ and ½ inch mesh nets reinforced with chicken wire to protect them from beaver damage, thus allowing for some small-bodied fish movement. Depletions will initially occur before arrival of larval CPM. We

will sample all backwaters following the YOY CPM sampling protocol every two weeks after initial depletions to determine levels of nonnative fish encroachment through time. However, we will monitor backwaters weekly to ensure that the block nets remain intact.

During this investigation, habitat information essential for ISMP sampling will be collected, as well as information on backwater temperature using temperature loggers. We will enumerate nonnatives and take a sub-sample to determine average total length of nonnative species in addition to total lengths for all native fish collected. Backwater and seine haul dimensions will be recorded.

VII. Task Description and Schedule:

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

Task 4. Data analysis and reporting.

Task 5. Field support for Argonne backwater topography data collection.

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

Deliverables and Due Dates:

Note: Field work will not be conducted for this project in 2015 so that a mid-term report summarizing the first three years of data can be completed, thus providing further guidance for the future of this project.

Final/Interim report due to the Recovery Program by February 1, 2016

Annual report for each year due to the Recovery Program by November

Budget:

FY 2016

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

FWS Vernal 2016 Budget				
Task Activity	Rate \$/h	Hours	Cost	
Task 1a-Drift net sampling (25 days)				
Labor				
GS-12 Biologist	\$55.14	80	\$4,411	
GS-05 Technician	\$24.96	200	\$4,992	
Subtotal			\$9,403	
Equipment				
(1 trucks/trip x 52 mi/truck x \$0.31/mi x 25 days) Vernal to Split Mtn., round trip			\$403	
GSA truck (rate/mo x # truck-months)	\$313	2	\$626	
drift net	\$585	1	\$585	
flow meter	\$400	1	\$400	
ethanol (5 gallon containers)	\$91	5	\$455	
Sample containers (1 case-20mL glass scintillation vials)	\$62.53	2	\$125	
Subtotal			\$2,594	
Task 1b-seining backwaters (10 days)				
Labor				
GS-12 Biologist	\$55.14	80	\$4,411	
GS-05 Technician (x3)	\$24.96	240	\$5,990	
Subtotal			\$10,402	
Equipment				
(2 trucks/trip x 80 mi/truck x \$0.31/mi x 10 days) Vernal to Ouray NWR, round trip			\$496	
GSA truck (rate/mo x # truck-months)	\$313	1	\$313	
seine	\$65	1	\$65	
ethanol (5 gallon containers)	\$91	5	\$455	
Sample containers (1 case-20mL glass scintillation vials)	\$62.53	200	\$12,506	
boat gas (12 gal/boat x 2 boats/day x \$4/gal x 10 days)			\$960	
GS-8 Fish Tech maintenance work	\$38.72	80	\$3,098	
Subtotal			\$17,893	
TASK 1 TOTAL			\$40,292	

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

	Rate	Hours/Units	Cost
Labor			
Project Leader	35.48	140	4967.20
Biologist II	33.12	100	3312.00
Journey Maintenance/Construction Specialist	26.66	120	3199.20
Technician I	16.23	80	1298.40
Shuttle Drivers	16.58	40	663.19
		Subtotal	\$13,440
Travel			
2 trucks @ 5% of annual use ^a	13600.00	0.05	680.00
Per diem (8 day trips x 4 people)	13.00	32	416.00
		Subtotal	\$1,096
Equipment			
Boat fuel (gallons)	4.00	48	192.00
Boat oil (quarts)	11.00	3	33.00
Block nets (Memphis Net & Twine)	900.00	2	1800.00
Replacement seines (Memphis Net & Twine)	150.00	1	150.00
Ethanol (20 L)	70.00	1	70.00
Sample vials	3.50	25	87.50
Boat/motor repair and maintenance ^b			500.00
Sampling equipment ^c			700.00
		Subtotal	\$3,533
		Task 2 Total	\$18,068

(a) 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.

(b) Boat/motor repair and maintenance includes, but is not limited to prop/water pump/filters/lower unit oil/grease/gas can/misc. maintenance items (\$500), shop supplies/tools/safety gear/misc. small parts (\$500).

(c) Sampling equipment includes, but is not limited to rebar/t-posts/chicken wire/zipties (\$500), batteries (\$200), waders (Simms-\$400), livewell/buckets/fish nets/measuring boards (\$300).

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

	Rate	Hours/Units	Cost
Labor			
Project Leader	35.48	240	8515.20
Biologist II	33.12	240	7948.80
Journey Maintenance/Construction Specialist	26.66	300	7998.00
Shuttle Drivers	16.58	120	1989.58
		Subtotal	\$26,452
Travel			
2 trucks @ 10% of annual use ^a	13600.00	0.1	1360.00
Per diem (24 day trips x 3 people)	13.00	72	936.00
		Subtotal	\$2,296
Equipment			
Boat fuel (gallons)	4.00	144	576.00
Ethanol (20 L)	70.00	1	70.00
Sample vials	3.50	25	87.50
Boat/motor repair and maintenance ^b			500.00
Sampling equipment ^c			689.00
		Subtotal	\$1,923
		Task 3 Total	\$30,670

Task 4. Data analysis and reporting.

	Rate	Hours/Units	Cost
Labor			
Project Leader	35.48	120	4257.60
Biologist II	33.12	100	3312.00
Technician II (Assistant Crew Leader)	17.48	200	3496.00
		Task 4 Total	\$11,066
		UDWR FY 2016 Total	\$59,804

Task 4- Data Analysis, Reporting, Administration: Vernal-CRFP			
Labor			
GS-12 Supervisory Fish Biologist	\$55.14	80	\$4,411
GS-9 Admin Assist.	\$39.19	80	\$3,135
		TASK 4 TOTAL	\$7,546

Task 5. Field support for Argonne backwater topography data collection.

Task 5-Field support for backwater topography	Rate \$/h	Hours	Cost
Labor			
WG-5 Boat Operator	\$24.96	80	\$1,513
WG-5 Boat Operator trip prep	\$24.96	16	\$303
GS-8 Fish Tech	\$38.72	96	\$3,599
Subtotal			\$5,414
Equipment			
(2 trucks/day x 55 mi/truck x \$0.31/mi x 8 days) Vernal to Ouray NWR, round trip			\$273
(12 gal gas/boat x 2 boats/day x \$4.00/gal x 8 days)			\$768
GSA truck (rate/mo x # truck-months)	\$313	1	\$313
GS-8 Fish Tech maintenance work	\$38.72	40	\$1,500
Subtotal			\$2,853
TASK 5 TOTAL			\$8,268
FWS SOW TOTAL			\$56,106

UDWR FY 2016 Total: \$59,804
 USFWS FY2016 Total: \$56,106
Total SOW FY16 Budget: \$115,910

FY 2017

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

FWS Vernal 2017				
Task Activity	Rate \$/h	Hours	Cost	
Task 1a-Drift net sampling (25 days)				
Labor				
GS-12 Biologist	\$56.25	80	\$4,500	
GS-05 Technician	\$25.70	200	\$5,140	
Subtotal			\$9,640	
Equipment				
(1 trucks/trip x 52 mi/truck x \$0.32/mi x 25 days) Vernal to Split Mtn., round trip			\$416	
GSA truck (rate/mo x # truck-months)	\$320	2	\$640	
drift net	\$585	1	\$585	
flow meter	\$400	1	\$400	
ethanol (5 gallon containers)	\$93	5	\$464	
Sample containers (1 case-20mL glass scintillation vials)	\$63.78	2	\$128	
Subtotal			\$2,633	
Task 1b-seining backwaters (10 days)				
Labor				
GS-12 Biologist	\$56.25	80	\$4,500	
GS-05 Technician (x3)	\$25.70	240	\$6,168	
Subtotal			\$10,668	
Equipment				
(2 trucks/trip x 80 mi/truck x \$0.32/mi x 10 days) Vernal to Ouray NWR, round trip			\$512	
GSA truck (rate/mo x # truck-months)	\$320	1	\$320	
seine	\$65	1	\$65	
ethanol (5 gallon containers)	\$93	5	\$464	
Sample containers (1 case-20mL glass scintillation vials)	\$63.78	200	\$12,756	
boat gas (12 gal/boat x 2 boats/day x \$4/gal x 10 days)			\$960	
GS-8 Fish Tech maintenance work	\$39.74	80	\$3,179	
Subtotal			\$18,256	
TASK 1 TOTAL			\$41,197	

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.19	140	5066.54
Biologist II	33.78	100	3378.24
Journey Maintenance/Construction Specialist	27.19	120	3263.18
Technician I	16.55	80	1324.37
Shuttle Drivers	16.91	40	676.46
		Subtotal	\$13,709
Travel			
2 trucks @ 5% of annual use ^a	13872.00	0.05	693.60
Per diem (8 day trips x 4 people)	13.26	32	424.32
		Subtotal	\$1,118
Equipment			
Boat fuel (gallons)	4.08	48	195.84
Boat oil (quarts)	11.22	3	33.66
Block nets (Memphis Net & Twine)	918.00	2	1836.00
Replacement seines (Memphis Net & Twine)	153.00	1	153.00
Ethanol (20 L)	71.40	1	71.40
Sample vials	3.57	25	89.25
Boat/motor repair and maintenance ^b			510.00
Sampling equipment ^c			714.00
		Subtotal	\$3,603
		Task 2 Total	\$18,430

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.19	240	8685.50
Biologist II	33.78	240	8107.78
Journey Maintenance/Construction Specialist	27.19	300	8157.96
Shuttle Drivers	16.91	120	2029.37
		Subtotal	\$26,981
Travel			
2 trucks @ 10% of annual use ^a	13872.00	0.1	1387.20
Per diem (24 day trips x 3 people)	13.26	72	954.72
		Subtotal	\$2,342
Equipment			
Boat fuel (gallons)	4.08	144	587.52
Ethanol (20 L)	71.40	2	142.80
Sample vials	3.57	50	178.50

Boat/motor repair and maintenance ^b	510.00
Sampling equipment ^c	702.78
Subtotal	\$2,122
Task 3 Total	\$31,444

Task 4. Data analysis and reporting.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.19	120	4342.75
Biologist II	33.78	100	3378.24
Technician II (Assistant Crew Leader)	17.83	200	3565.92
Task 4 Total			\$11,287
UDWR FY 2017 Total			\$61,161

Task 4- Data Analysis, Reporting, Administration: Vernal-CRFP			
Labor			
GS-12 Supervisory Fish Biologist	\$66.58	80	\$5,326
GS-9 Admin Assist.	\$39.98	80	\$3,198
TASK 4 TOTAL			\$8,524

Task 5. Field support for Argonne backwater topography data collection.

Task 5-Field support for backwater topography	Rate \$/h	Hours	Cost
Labor			
WG-5 Boat Operator	\$25.70	80	\$1,513
WG-5 Boat Operator trip prep	\$25.70	16	\$303
GS-8 Fish Tech	\$39.74	96	\$3,599
Subtotal			\$5,414
Equipment			
(2 trucks/day x 55 mi/truck x \$0.32/mi x 8 days) Vernal to Ouray NWR, round trip			\$282
(12 gal gas/boat x 2 boats/day x \$4.00/gal x 8 days)			\$768
GSA truck (rate/mo x # truck-months)	\$320	1	\$313
GS-8 Fish Tech maintenance work	\$39.74	40	\$1,500
Subtotal			\$2,862
TASK 5 TOTAL			\$8,277
FWS SOW TOTAL			\$57,998

UDWR FY 2016 Total: \$61,161
 USFWS FY2016 Total: \$57,998
Total SOW FY16 Budget: \$119,159

FY 2018

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

FWS Vernal 2018				
Task Activity	Rate \$/h	Hours	Cost	
Task 1a-Drift net sampling (25 days)				
Labor				
GS-12 Biologist	\$57.38	80	\$4,590	
GS-05 Technician	\$26.48	200	\$5,296	
Subtotal			\$9,886	
Equipment				
(1 trucks/trip x 52 mi/truck x \$0.33/mi x 25 days) Vernal to Split Mtn., round trip			\$429	
GSA truck (rate/mo x # truck-months)	\$325	2	\$650	
drift net	\$585	1	\$585	
flow meter	\$400	1	\$400	
ethanol (5 gallon containers)	\$95	5	\$474	
Sample containers (1 case-20mL glass scintillation vials)	\$65.06	2	\$130	
Subtotal			\$2,668	
Task 1b-seining backwaters (10 days)				
Labor				
GS-12 Biologist	\$57.38	80	\$4,590	
GS-05 Technician (x3)	\$26.48	240	\$6,355	
Subtotal			\$10,946	
Equipment				
(2 trucks/trip x 80 mi/truck x \$0.33/mi x 10 days) Vernal to Ouray NWR, round trip			\$528	
GSA truck (rate/mo x # truck-months)	\$325	1	\$325	
seine	\$65	1	\$65	
ethanol (5 gallon containers)	\$95	5	\$474	
Sample containers (1 case-20mL glass scintillation vials)	\$65.06	200	\$13,011	
boat gas (12 gal/boat x 2 boats/day x \$4/gal x 10 days)			\$960	
GS-8 Fish Tech maintenance work	\$40.53	80	\$3,242	
Subtotal			\$18,605	
TASK 1 TOTAL			\$42,105	

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.91	140	5167.87
Biologist II	34.46	100	3445.80
Journey Maintenance/Construction Specialist	27.74	120	3328.45
Technician I	16.89	80	1350.86
Shuttle Drivers	17.25	40	689.99
		Subtotal	\$13,983
Travel			
2 trucks @ 5% of annual use ^a	14149.44	0.05	707.47
Per diem (8 day trips x 4 people)	13.53	32	432.81
		Subtotal	\$1,140
Equipment			
Boat fuel (gallons)	4.16	48	199.76
Boat oil (quarts)	11.44	3	34.33
Block nets (Memphis Net & Twine)	936.36	2	1872.72
Replacement seines (Memphis Net & Twine)	156.06	1	156.06
Ethanol (20 L)	72.83	1	72.83
Sample vials	3.64	25	91.04
Boat/motor repair and maintenance ^b			520.20
Sampling equipment ^c			728.28
		Subtotal	\$3,675
			Task 2 Total
			\$18,798

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.91	240	8859.21
Biologist II	34.46	240	8269.93
Journey Maintenance/Construction Specialist	27.74	300	8321.12
Shuttle Drivers	17.25	120	2069.96
		Subtotal	\$27,520
Travel			
2 trucks @ 10% of annual use ^a	14149.44	0.1	1414.94
Per diem (24 day trips x 3 people)	13.53	72	973.81
		Subtotal	\$2,389
Equipment			
Boat fuel (gallons)	4.16	144	599.27
Ethanol (20 L)	72.83	2	145.66
Sample vials	3.64	50	182.07

Boat/motor repair and maintenance ^b	520.20
Sampling equipment ^c	716.84
Subtotal	\$2,164
Task 3 Total	\$32,073

Task 4. Data analysis and reporting.

	Rate	Hours/Units	Cost
Labor			
Project Leader	36.91	120	4429.61
Biologist II	34.46	100	3445.80
Technician II (Assistant Crew Leader)	18.19	200	3637.24
Task 4 Total			\$11,513
UDWR FY 2018 Total			\$62,384

Task 4- Data Analysis, Reporting, Administration: Vernal-CRFP			
Labor			
GS-12 Supervisory Fish Biologist	\$57.38	80	\$4,590
GS-9 Admin Assist.	\$40.78	80	\$3,262
TASK 4 TOTAL			\$7,852

Task 5. Field support for Argonne backwater topography data collection.

Task 5-Field support for backwater topography	Rate \$/h	Hours	Cost
Labor			
WG-5 Boat Operator	\$26.48	80	\$1,513
WG-5 Boat Operator trip prep	\$26.48	16	\$303
GS-8 Fish Tech	\$40.53	96	\$3,599
Subtotal			\$5,414
Equipment			
(2 trucks/day x 55 mi/truck x \$0.33/mi x 8 days) Vernal to Ouray NWR, round trip			\$290
(12 gal gas/boat x 2 boats/day x \$4.00/gal x 8 days)			\$768
GSA truck (rate/mo x # truck-months)	\$325	1	\$313
GS-8 Fish Tech maintenance work	\$40.53	40	\$1,500
Subtotal			\$2,871
TASK 5 TOTAL			\$8,285
FWS SOW TOTAL			\$58,242

UDWR FY 2016 Total: \$62,384
 USFWS FY2016 Total: \$58,242
Total SOW FY16 Budget: \$120,626

FY 2019

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

FWS Vernal 2019				
Task Activity	Rate \$/h	Hours	Cost	
Task 1a-Drift net sampling (25 days)				
Labor				
GS-12 Biologist	\$58.52	80	\$4,682	
GS-05 Technician	\$27.27	200	\$5,454	
Subtotal			\$10,136	
Equipment				
(1 trucks/trip x 52 mi/truck x \$0.34/mi x 25 days) Vernal to Split Mtn., round trip			\$442	
GSA truck (rate/mo x # truck-months)	\$332	2	\$664	
drift net	\$585	1	\$585	
flow meter	\$400	1	\$400	
ethanol (5 gallon containers)	\$97	5	\$483	
Sample containers (1 case-20mL glass scintillation vials)	\$66.36	2	\$133	
Subtotal			\$2,707	
Task 1b-seining backwaters (10 days)				
Labor				
GS-12 Biologist	\$58.52	80	\$4,682	
GS-05 Technician (x3)	\$27.27	240	\$6,545	
Subtotal			\$11,226	
Equipment				
(2 trucks/trip x 80 mi/truck x \$0.34/mi x 10 days) Vernal to Ouray NWR, round trip			\$544	
GSA truck (rate/mo x # truck-months)	\$332	1	\$332	
seine	\$65	1	\$65	
ethanol (5 gallon containers)	\$97	5	\$483	
Sample containers (1 case-20mL glass scintillation vials)	\$66.36	200	\$13,271	
boat gas (12 gal/boat x 2 boats/day x \$4/gal x 10 days)			\$960	
GS-8 Fish Tech maintenance work	\$41.35	80	\$3,308	
Subtotal			\$18,964	
TASK 1 TOTAL			\$43,032	

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

	Rate	Hours/Units	Cost
Labor			
Project Leader	37.65	140	5271.23
Biologist II	35.15	100	3514.72
Journey Maintenance/Construction Specialist	28.29	120	3395.02
Technician I	17.22	80	1377.87
Shuttle Drivers	17.59	40	703.79
		Subtotal	\$14,263
Travel			
2 trucks @ 5% of annual use ^a	14432.43	0.05	721.62
Per diem (8 day trips x 4 people)	13.80	32	441.46
		Subtotal	\$1,163
Equipment			
Boat fuel (gallons)	4.24	48	203.75
Boat oil (quarts)	11.67	3	35.02
Block nets (Memphis Net & Twine)	955.09	2	1910.17
Replacement seines (Memphis Net & Twine)	159.18	1	159.18
Ethanol (20 L)	74.28	1	74.28
Sample vials	3.71	25	92.86
Boat/motor repair and maintenance ^b			530.60
Sampling equipment ^c			742.85
		Subtotal	\$3,749
		Task 2 Total	\$19,174

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

	Rate	Hours/Units	Cost
Labor			
Project Leader	37.65	240	9036.40
Biologist II	35.15	240	8435.33
Journey Maintenance/Construction Specialist	28.29	300	8487.54
Shuttle Drivers	17.59	120	2111.36
		Subtotal	\$28,071
Travel			
2 trucks @ 10% of annual use ^a	14432.43	0.1	1443.24
Per diem (24 day trips x 3 people)	13.80	72	993.29
		Subtotal	\$2,437
Equipment			
Boat fuel (gallons)	4.24	144	611.26
Ethanol (20 L)	74.28	2	148.57
Sample vials	3.71	50	185.71

Boat/motor repair and maintenance ^b	530.60
Sampling equipment ^c	731.17
Subtotal	\$2,207
Task 3 Total	\$32,714

Task 4. Data analysis and reporting.

	Rate	Hours/Units	Cost
Labor			
Project Leader	37.65	120	4518.20
Biologist II	35.15	100	3514.72
Technician II (Assistant Crew Leader)	18.55	200	3709.98
Task 4 Total			\$11,743
UDWR FY 2019 Total			\$63,632

Task 4- Data Analysis, Reporting, Administration: Vernal-CRFP			
Labor			
GS-12 Supervisory Fish Biologist	\$58.52	80	\$4,682
GS-9 Admin Assist.	\$41.60	80	\$3,328
TASK 4 TOTAL			\$8,010

Task 5. Field support for Argonne backwater topography data collection.

Task 5-Field support for backwater topography	Rate \$/h	Hours	Cost
Labor			
WG-5 Boat Operator	\$27.27	80	\$1,513
WG-5 Boat Operator trip prep	\$27.27	16	\$303
GS-8 Fish Tech	\$41.35	96	\$3,599
Subtotal			\$5,414
Equipment			
(2 trucks/day x 55 mi/truck x \$0.34/mi x 8 days) Vernal to Ouray NWR, round trip			\$299
(12 gal gas/boat x 2 boats/day x \$4.00/gal x 8 days)			\$768
GSA truck (rate/mo x # truck-months)	\$332	1	\$313
GS-8 Fish Tech maintenance work	\$41.35	40	\$1,500
Subtotal			\$2,880
TASK 5 TOTAL			\$8,294
FWS SOW TOTAL			\$59,336

UDWR FY 2016 Total: \$63,632
 USFWS FY2016 Total: \$59,336
Total SOW FY16 Budget: \$122,968

FY 2020

Task 1. Determine abundance of larval CPM present in drift at Split Mountain and arriving in backwaters in the Ouray reach.

FWS Vernal 2020				
Task Activity	Rate \$/h	Hours	Cost	
Task 1a-Drift net sampling (25 days)				
Labor				
GS-12 Biologist	\$59.69	80	\$4,775	
GS-05 Technician	\$28.09	200	\$5,618	
Subtotal			\$10,393	
Equipment				
(1 trucks/trip x 52 mi/truck x \$0.35/mi x 25 days) Vernal to Split Mtn., round trip			\$455	
GSA truck (rate/mo x # truck-months)	\$338	2	\$676	
drift net	\$585	1	\$585	
flow meter	\$400	1	\$400	
ethanol (5 gallon containers)	\$99	5	\$493	
Sample containers (1 case-20mL glass scintillation vials)	\$67.68	2	\$135	
Subtotal			\$2,744	
Task 1b-seining backwaters (10 days)				
Labor				
GS-12 Biologist	\$59.69	80	\$4,775	
GS-05 Technician (x3)	\$28.09	240	\$6,742	
Subtotal			\$11,517	
Equipment				
(2 trucks/trip x 80 mi/truck x \$0.35/mi x 10 days) Vernal to Ouray NWR, round trip			\$560	
GSA truck (rate/mo x # truck-months)	\$338	1	\$338	
seine	\$65	1	\$65	
ethanol (5 gallon containers)	\$99	5	\$493	
Sample containers (1 case-20mL glass scintillation vials)	\$67.68	200	\$13,537	
boat gas (12 gal/boat x 2 boats/day x \$4/gal x 10 days)			\$960	
GS-8 Fish Tech maintenance work	\$42.17	80	\$3,374	
Subtotal			\$19,326	
TASK 1 TOTAL			\$43,980	

Task 2. Deplete nonnative fish in backwaters prior to larval CPM drift and apply backwater blocking treatments.

	Rate	Hours/Units	Cost
Labor			
Project Leader	38.40	140	5376.66
Biologist II	35.85	100	3585.02
Journey Maintenance/Construction Specialist	28.86	120	3462.92
Technician I	17.57	80	1405.43
Shuttle Drivers	17.95	40	717.86
		Subtotal	\$14,548
Travel			
2 trucks @ 5% of annual use ^a	14721.08	0.05	736.05
Per diem (8 day trips x 4 people)	14.07	32	450.29
		Subtotal	\$1,186
Equipment			
Boat fuel (gallons)	4.33	48	207.83
Boat oil (quarts)	11.91	3	35.72
Block nets (Memphis Net & Twine)	974.19	2	1948.38
Replacement seines (Memphis Net & Twine)	162.36	1	162.36
Ethanol (20 L)	75.77	1	75.77
Sample vials	3.79	25	94.71
Boat/motor repair and maintenance ^b			541.22
Sampling equipment ^c			757.70
		Subtotal	\$3,824
		Task 2 Total	\$19,558

Task 3. Determine fish community composition in manipulated and control backwaters throughout the summer base flow period.

	Rate	Hours/Units	Cost
Labor			
Project Leader	38.40	240	9217.13
Biologist II	35.85	240	8604.04
Journey Maintenance/Construction Specialist	28.86	300	8657.29
Shuttle Drivers	17.95	120	2153.58
		Subtotal	\$28,632
Travel			
2 trucks @ 10% of annual use ^a	14721.08	0.1	1472.11
Per diem (24 day trips x 3 people)	14.07	72	1013.16
		Subtotal	\$2,485
Equipment			
Boat fuel (gallons)	4.33	144	623.48
Ethanol (20 L)	75.77	2	151.54
Sample vials	3.79	50	189.43

Boat/motor repair and maintenance ^b	541.22
Sampling equipment ^c	745.80
Subtotal	\$2,251
Task 3 Total	\$33,369

Task 4. Data analysis and reporting.

	Rate	Hours/Units	Cost
Labor			
Project Leader	38.40	120	4608.56
Biologist II	35.85	100	3585.02
Technician II (Assistant Crew Leader)	18.92	200	3784.18
Task 4 Total			\$11,978
UDWR FY 2020 Total			\$64,904

Task 4- Data Analysis, Reporting, Administration: Vernal-CRFP			
Labor			
GS-12 Supervisory Fish Biologist	\$59.69	80	\$4,775
GS-9 Admin Assist.	\$42.43	80	\$3,394
TASK 4 TOTAL			\$8,169

Task 5. Field support for Argonne backwater topography data collection.

Task 5-Field support for backwater topography	Rate \$/h	Hours	Cost
Labor			
WG-5 Boat Operator	\$28.09	80	\$1,513
WG-5 Boat Operator trip prep	\$28.09	16	\$303
GS-8 Fish Tech	\$42.17	96	\$3,599
Subtotal			\$5,414
Equipment			
(2 trucks/day x 55 mi/truck x \$0.35/mi x 8 days) Vernal to Ouray NWR, round trip			\$308
(12 gal gas/boat x 2 boats/day x \$4.00/gal x 8 days)			\$768
GSA truck (rate/mo x # truck-months)	\$338	1	\$313
GS-8 Fish Tech maintenance work	\$42.17	40	\$1,500
Subtotal			\$2,889
TASK 5 TOTAL			\$8,303
FWS SOW TOTAL			\$60,452

UDWR FY 2016 Total: \$64,904
 USFWS FY2016 Total: \$60,452
Total SOW FY16 Budget: \$125,356

IX. Budget Summary:

	UDWR - Vernal	CRFP - Vernal	Total
FY 2016	\$59,804	\$ 56,106	\$ 115,910
FY 2017	\$61,161	\$ 57,998	\$ 119,159
FY 2018	\$62,384	\$ 58,242	\$ 120,626
FY 2019	\$63,632	\$ 59,336	\$ 122,968
FY 2020	\$64,904	\$ 60,452	\$ 125,356
Total			\$ 604,019

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

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- Skorupski, J.A., M.J. Breen and T. Jones. 2012. Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats 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 G.B Haines. 1991. Distribution, habitat use, and growth of age-0 Colorado squawfish in the Green River basin, Colorado and Utah. *Transactions of the American Fisheries Society* 120: 79-89.