COLORADO RIVER RECOVERY PROGRAM Project No.: 128
FY-2010-2011 PROPOSED SCOPE OF WORK

Lead Agency: Larval Fish Laboratory (LFL)

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Category:	Expected Funding Source:
__ Ongoing project	x Annual funds
X Ongoing-revised project	_ Capital funds
__ Requested new project	_ Other (explain)
__ Unsolicited proposal	

I. Title of Proposal: **Abundance Estimates for Colorado pikeminnow in the Green River Basin, Utah and Colorado**

Note: During Colorado pikeminnow monitoring, any centrarchids/esocids captured incidentally will be removed (except in the Yampa River). In the White River, capture locations will be recorded.

II. Relationship to RIPRAP:
Green River Action Plan: Mainstem
- V. Monitor populations and habitat and conduct research to support recovery actions (Research, monitoring, and data management).
- V.C. Population estimate for Colorado pikeminnow.
- V.C.1. Middle Green River

III. Study Background/Rationale and Hypotheses:

Background.—Abundance estimates of endangered Colorado pikeminnow *Ptychocheilus lucius* are needed to better monitor population status and provide benchmarks against which progress toward recovery can be measured. The 1998 meeting of the *Interagency Standardized Monitoring Program* (*ISMP*) workgroup recommended obtaining abundance estimates for each population of endangered fish. The Genetics Management Plan identified a population (the Yampa-Green stock) of Colorado pikeminnow that inhabits the middle Green River (Middle Green River reach) from Lodore Canyon downstream to approximately the White River. The middle Green River stock includes fish in the Yampa River (Yampa River reach) and the White

River (White River reach); the few fish captured in the Duchesne River are included in the middle Green River reach. The other Green River stock resides in the mainstem Green River downstream of the White River. Two reaches include the Desolation-Gray Canyon portion of the Green River (Desolation-Gray Canyon reach) and the lower Green River (lower Green River reach) from about the town of Green River, Utah, downstream to the confluence of the Colorado River. This scope of work outlines a procedure to obtain abundance estimates for sub-adult (400 to 449 mm total length (TL)) and adult (> 450 mm TL) Colorado pikeminnow in each of the five reaches of the Green River Basin, Colorado and Utah, as described above. From those reach estimates, an abundance estimate for each length-based life stage will be estimated for the entire Green River Basin.

Catch/effort data that describes abundance of sub-adult /adult Colorado pikeminnow have been collected in the Colorado (three reaches), Green (five reaches), Yampa (three reaches), and White (two reaches) rivers from1986 to 2000 under the auspices of the *ISMP*. Abundance estimates based on capture-recapture sampling were made from 2000-2003 in the middle Green River and from 2001 to 2003 in the lower Green River. Collectively, these data suggested increased abundance of Colorado pikeminnow in the Green River Basin until 2000 but abundance estimates indicated an apparent decline after that (Bestgen et al. 2005; 2007). Recovery goals call for sampling on a three year on, two year off schedule and abundance estimates for the Green River population are due again from 2011 to 2013. Therefore, this proposal outlines procedures to conduct capture-recapture sampling similar to that conducted from 2000 to 2003 and 2006-2008 using uniquely marked animals so that the necessary abundance estimates can be calculated.

Parameter estimation models and assumptions.—Two general classes of models can be used to estimate abundance of animal populations in the wild and are differentiated based on assumptions about population demographics. The first class of models are closed population estimators. Closed population estimators have three main assumptions. The first is that the population is closed so that N, the true population size, is constant during the short-term annual sampling event. Geographic closure assumes that there is no immigration to or emigration from the population of interest. Demographic closure assumes no births or deaths within the sampling period. A second assumption that is often difficult to meet is that all individuals in the population have the same probability of being captured during each sampling occasion. Differences in capture probability among individuals are well-known in fish populations, often involving size related differences in susceptibility to the sampling gear. Another situation that may cause unequal probability of capture is a group of individuals that occupy a habitat type different than that used by most individuals in the population. Behavioral differences may also cause differences in capture probability among individuals. Capture probabilities may also vary among capture occasions because of changes in environmental conditions such as stream flow. A third assumption of closed abundance estimators is that previously marked animals can be reliably distinguished from unmarked animals.

The second class of models is open population estimators. Open population models are useful to estimate population abundance as well as the joint probability of survival/immigration, and births or recruitment/emigration (Burnham et al. 1987, Lebreton et al. 1992). This general model class is termed the Jolly-Seber (J-S) model (Jolly 1965, Seber 1965). Similar to closed population models, J-S population estimation models assume that tagged fish are representative of the population to which inferences are being made and that the fate of individuals is independent of each other. An assumption not common with closed abundance estimators is that fish in an identifiable class or group (e.g., adults) have the same survival and capture probabilities for each time interval. A consequence of this component in J-S population models is that all releases should be made within a short time period so that rates among individuals are the same. The J-S models do not generally require assumptions of no immigration/emigration, and no recruitment or mortality. An exception is that geographic closure is still important when population size is the parameter of interest. Although open models can estimate more and different parameters and have less restrictive underlying assumptions, abundance estimates generated from such models are often less precise than those for closed population models. Another disadvantage of abundance estimates calculated from open population models is that they are all based on model M_t, a model that allows for time varying probabilities of capture. Although time variation is likely among sampling occasions, J-S models assume no heterogeneity or behavioral response among individuals in the estimated population. Thus, abundance estimates calculated from open population models do not allow as thorough an evaluation of assumptions as do closed population models.

Robust design for capture-recapture studies.—The robust design attempts to capitalize on the strengths of closed and open population models by combining the use of each in an overall sampling and estimation program (Pollock 1982, 1990). The robust design employs sampling at two scales. Sampling occasions completed at closely spaced intervals (e.g. weeks) are used to estimate population size using closed population models. That level of sampling completed in two or more consecutive years allows for estimation of population probabilities of capture, recruitment, and annual survival rates. The robust design approach was employed by Osmundson and Burnham (1998) and Bestgen et al. (2005; 2007) to estimate abundance and survival rate of Colorado pikeminnow in the Colorado River and the Green River, respectively. This approach offers advantages of both closed and open population estimation methods if certain assumptions are met. A particular advantage is that the robust design allows evaluation of heterogeneity effects within individuals among capture occasions. We can meet the requirements of the robust study design with the approach described below. We will also analyze razorback sucker data gathered associated with this project.

IV. Study Goals, Objectives, End Product:

Goals: Obtain accurate (unbiased) and reliable (precise) estimates of adult population abundance and survival of Colorado pikeminnow that occupy the Green River study area.

Objectives:

1. Complete a minimum of three sampling passes through the five Green River Basin reaches listed to capture sub-adult and adult Colorado pikeminnow:

   a) Green River between the confluence of the White River upstream to the lower end of Whirlpool Canyon (i.e., upper Rainbow Park).

   b) White River between the confluence of the Green River upstream to Taylor Draw Dam,

   c) Yampa River between Deerlodge Park and Craig, excluding Cross Mountain Canyon,

   d) Green River from the White River confluence downstream to near Green River, Utah, and,

   e) Green River from downstream of Green River, Utah, to the confluence with the Colorado River.

The LFL and CDOW will attempt up to six sampling passes in the Yampa River, in part associated with bass and northern pike removal projects, in order to obtain a more precise and accurate Colorado pikeminnow abundance estimate.

2. Obtain highest possible rates of capture of Colorado pikeminnow within concentration habitats and maximize number of individuals marked and captured on each sampling occasion.

3. Obtain estimates of probability of capture and abundance for Colorado pikeminnow in each of the five reach and for the entire study area.

End Products: The end products are abundance and survival estimates for sub-adult and adult Colorado pikeminnow for each of the White, Yampa, and Green River populations. An overall estimate will also be calculated. That report should be available in summer 30 June 2014.

Report Review schedule: Annual reports will be submitted each year. A final summary report for Green River Colorado pikeminnow data will be submitted to the Recovery Program Coordinator in summer 2013.

The Colorado pikeminnow analyses (including the Colorado River data analysis and the Green River data analysis and report) will include:

1. Abundance estimates for all reaches and the entire basin for all three years.
2. A summary of sampling effort and discussion of issues related to sampling efficiency.
3. A list of PIT tagged fish will be submitted to the database manager at the end of each year.
4. Depending on the wishes of the Biology Committee and the Recovery Program, other parameter estimates such as survival rates and population rates of change may be estimated.

V. Study Area

The razorback sucker data analysis and monitoring plan development will include the Colorado and Green River sub-basins.

VI. Study Methods/Approach

We propose to conduct abundance estimation for sub-adult and adult life stages of Colorado pikeminnow in the Green, White, and Yampa rivers as outlined in the Study Area description. Investigators will thoroughly sample habitat where Colorado pikeminnow are known to congregate (concentration habitat) in each reach on three separate, consecutive occasions (passes) during springtime beginning just after ice-off and ending prior to or during runoff. Concentration habitats are usually shorelines, eddies, pools, flooded tributary mouths, and backwaters. This approach will permit annual abundance estimate calculations for populations by reach and also allows for a combined estimate for the study area. This sampling program conducted over a three-year period will fulfill the requirements of the robust design and also permit calculation of survival estimates for pikeminnow in the study area.

Annual sampling to estimate pikeminnow abundance.—Annual sampling will involve a minimum of three sampling occasions through the five river reaches identified above. The three sampling occasions will be conducted in spring between the time when ice off occurs and end prior to or during spring runoff before pikeminnow migration begins. Sampling will begin at the top of each major reach and proceed downstream. It is important to maximize the number of fish captured on each pass (Lebreton et al. 1992). Different gear types may be used in different sampling areas. Electrofishing will be the primary gear in main channel and small backwaters. Large backwaters and concentration areas may be sampled with a blocking trammel net and perhaps electrofishing. Gear use depends on habitat availability as well but will be applied as consistently as possible across reaches and rivers. The goal of using different gear types is to maximize capture probability on each pass.

Investigators will proceed downriver, sampling all available Colorado pikeminnow concentration habitat on each pass. Information recorded at each Colorado pikeminnow capture location will be major habitat type (e.g., main channel pool, main channel eddy, backwater, flooded tributary mouth), a specific capture and release location identified by a GPS unit, and fish total length and mass. Each fish will be scanned for the presence of a PIT tag, making sure to follow standard Program protocols to ensure detection of tags with new and old frequencies. The fish will be tagged if it has not been previously marked, and the tag number recorded. The importance of back-up PIT tag scanners of both frequencies and adequate tagging supplies is critical to the success of this project. Scanning and tagging of all fish will reduce bias and result in the most accurate and precise abundance estimates possible. Tagged fish will be released in recovered condition at the point of capture.

After a single marking occasion is completed for the reach, they will proceed back to the upstream terminus and begin the second sampling occasion. A sufficient amount of time (e.g., 5-10 days) should elapse between the start of consecutive sampling occasions to allow for sufficient mixing of marked and unmarked fish. In the appropriate reaches, an *ISMP*-like sampling pass may be conducted within a primary sampling occasion to add to that data set.

Assumptions of closed population abundance estimators.—Fulfilling the assumptions underlying any abundance estimation model is a critical first step in the planning of a large field study. We have evaluated the assumptions of closed population abundance estimators in a previous study and feel confident that these assumptions can be met again (Bestgen et al. 2005). The first assumption, that of constant N during short-term annual sampling, can be assumed because the size of the study area dictates that the only point of emigration/immigration from the population of interest would be to or from the lower Green River. The likelihood of movement is much reduced at that time of year because fish occupy small and stable home ranges. Lack of movement during that time period will also reduce movement of fish within the main study area from sampled reaches to areas that may receive little or no sampling effort such as canyons. Limiting the target group of fish to sub-adult and adult pikeminnow and limiting sampling to a relatively short time period in spring prior to migration, eliminates the possibility of additions to the population through recruitment. This fulfills the assumption of demographic closure.

The second assumption of equal probability of capture of individuals is unlikely to be met except in all but the most restricted conditions. However, techniques can be employed to reduce effects of heterogeneity among capture probabilities of individuals (e.g. size effects). Variation among capture probabilities among reaches and years can be reduced by explicitly modeling time effects. We also utilized total length as a covariate in previous analyses to account for a proportion of capture heterogeneity due to fish size differences (Bestgen et al. (2005; 2007). Previous studies have shown that behavior effects such as avoidance of capture gear are not generally important (Bestgen et al 2005; 2007). An exception may be for Colorado pikeminnow 800-mm TL or larger, which had very low recapture rates among years. The low number of those fish in samples suggested that bias of abundance estimates due to presumed behavior effects of those larger fish should be low. A separate study may be necessary to fully understand if those behavior effects are important, or if low recapture rates of large Colorado pikeminnow are due to other factors.

Another assumption is of accurate recognition of marked and unmarked animals. To ensure that this assumption is fulfilled, investigators need to make sure tag detection equipment is in good operating order, carefully scan each fish with old and new types of tag scanners, and make sure tags are detectable prior to insertion. This requires that the tagging protocol be diligently followed.

Study duration.—The robust design requires at least two years of data collection in order for a survival estimate to be calculated, but the addition of more years will increase the number of estimates possible, and their accuracy and precision. Although survival estimation is not a main goal of this study, such estimates are useful for other purposes related to determining recovery goals and for comparison with survival rates of Colorado pikeminnow in other systems or periods (Osmundson and Burnham 1998, Bestgen et al. 2005; 2007). A minimum of three years of data will also yield three separate abundance estimates for pikeminnow in the study area, and will provide a consistency check for estimates among years.

Other considerations for FY 2011.—This sampling design does not include canyon reaches because fish are presumed rare in those habitats during the non-spawning period (Bestgen et al. 2005; 2007). Another consideration in the decision not to intensively sample canyon reaches is the high level of logistics and effort needed to accomplish such sampling. We will use ancillary data collected in those reaches, such as was done from 2000 to 2003 and 2006-2008, to evaluate that this consideration still holds (Bestgen et al. 2005; 2007).

Program Mark will be used to estimate abundance and survival estimates for Colorado pikeminnow in the study area. Program Mark is an omnibus data analysis program that allows exploration of a number of closed and open sampling design estimators for calculating estimates of abundance and survival. The robust design specifically incorporates closed model abundance estimation techniques, while survival is estimated from variants of the Jolly-Seber model.

VII. Task Description and Schedule (FY-2011)

Because of the complexity and short duration of the sampling design, and the need to use five relatively autonomous units to complete this work, we will continue to use a Standard Operating Procedure for field personnel to ensure a consistent sampling approach and timely completion of tasks. We will also have frequent conference calls with team members and field crews to discuss issues and problems. This will also provide an opportunity for each group to report on progress in completing tasks. The Larval Fish Laboratory will be responsible for routine coordination of the study. The Program Directors office will assist in resolution of problems related to timely completion of tasks.

Task 1. Feb.-March. Order and prepare equipment. This task relates to objectives 1 and 2.

Task 2. April. Scout locations, final equipment preparation. This task relates to objectives 1, 2, and 3. Several river reaches are relatively remote or on private property and will require reconnaissance to acquire permission and find boat launch and take-out sites.

Task 3. Apr.-June. 3-pass sampling. Relates to objectives 1-3.

Task 4. Jan.-Sept. Sampling team coordination, data entry, and analysis. Relates to 4 objectives 1-4.

Task 5. November_december. Write Recovery Program final summary report for data collected in 2011-2013, and prepare data analysis for Colorado River pikeminnow data analysis. Relates to objectives 3 and 4.

VIII. FY-2011 Work

- Deliverables/Due Dates. Project summary report November 2011.

Group/Agency	Reach	Cost FY-2011
Larval Fish Laboratory	Yampa River	85,189
Utah Division of Wildlife Resources, Vernal	middle Green River	62,494
U. S. Fish and Wildlife Service, Vernal	White River	59,633
U. S. Fish and Wildlife Service, Vernal	Desolatio-Gray Canyon, Green River	67,301
Utah Division of Wildlife Resources, Moab	lower Green River	116,548
	total	391,165

Budget by reach:

Larval Fish Laboratory, sampling and data analysis

Larval Fish Laboratory: Budget includes data analysis costs for Principal investigator. Budget presented assumes that ½ of field-related expenses associated with Colorado pikeminnow abundance estimation will be covered under project 125, pike and smallmouth bass removal in the middle Yampa River and under CDOW sampling. Additional funds are to be used to attempt five or six full passes (at present three complete passes and sampling in concentration areas three more times will be completed under existing CDOW and CSU projects) for the Yampa River to improve precision of abundance estimates. Fringe benefits are 25% of the total amount of salaries. LFL overhead rate is 17.5% and is charged to all items. Fringe on salary and overhead are figured into costs for LFL items.

Larval Fish Laboratory, FY2011

Tasks 1 and 2, Prepare sampling equipment, literature work, site visit

Item Labor	Units	Cost/unit	Cost
Principal investigator (d)	8	490	$3,920
Biologist (d)	5	330	$1,650
Senior technician (d)	7	190	$1,330
Technician (d)	7	145	$1,015
		subtotal	$7,915

Travel				
Per diem (d)	4	30		$120
Mileage (miles)	750	0.4		$300
			subtotal	$420
			Total	$8,335

Task 3, complete 3 sampling passes, 10d ea, represents 1/2 the costs, other 1/2 covered by project 125, pike and bass removal in the middle Yampa River

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	10	490		$4,900
Biologist (d)	15	330		$4,950
Senior technician (d)	15	190		$2,850
Technician (d)	60	145		$8,700
			subtotal	$21,400
Travel				
Per diem (d)	100	20		$2,000
Mileage (miles)	3600	0.4		$1,440
			subtotal	$3,440
Supplies				
gas	450	2.25		$1,013
oil	20	2.5		$50
motor repair	2	300		$600
nets, seines, pens	9	52		$468
preservative	1	33		33
misc camp gear	1	400		400
Misc sampling gear	1	400		400
			subtotal	$2,964
			Total	$27,804

Task 4, data entry and analysis

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	50	490		$24,500
Biologist (d)	25	330		$8,250
Senior technician (d)	38	190		$7,220
Technician (d)	7	145		$1,015
			subtotal	$40,985

Task 5, annual report preparation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	10	490		$4,900
Biologist (d)	3	330		$990
Senior technician (d)	5	190		$950
Technician (d)	5	145		$725
			subtotal	$7,565
Travel				
Meeting	1	500		$500
			subtotal	$500
			Total	$8,065
			Total tasks 1-5	$85,189

Middle Green River, Utah Division of Wildlife Resources, Vernal FY 2011

Task 1. Order, prepare equipment.

FY11 Task 1		
Labor-	Work days	Cost
Technician II (271/day)	16	$4,336
Biologist (340/day)	4	$1,360
Equipment (maintenance or replacement)[a]		$4,933
FY11 Task 1 Subtotal		**$10,629**

[a] Includes repair or replacement of outboard motor lower units, electrofishing gear repair and maintenance, and purchase of needed electrofishing equipment

Task 2. 3-pass sampling.

FY11 Task 2		
Labor-	Work days	Cost
Project Leader (400/day)	8	$3,200
Biologist (340/day)	21	$7,140
Technician II (222/day)	20	$4,440
Technician (195/day)	53	$10,335

Technician II (271/day)	20	$5,420
Shuttle Drivers (14.87/hr)	189 hrs	$2,811
Per Diem (6 people/day x $16/person x 21 days)	21	$2,016
Travel		
Vehicle (10573, 11204, & 11192, 20% of annual use each) Maintenance (Oil, cleaning)	21	$4,080 $400
Equipment (maintenance or replacement)[a] , boat gas		$2,967
FY11 Task 2 Subtotal		**$42,809**

[a] Includes repair or replacement of outboard motor lower units and electrofishing gear repair and maintenance.

Task. 3 Data entry and analysis.

FY11 Task 3		
Labor-	Work days	Cost
Project Leader (400/day)	4	$1,600
Biologist (340/day)	4	$1,360
Technician II (222/day)	8	$1,776
FY11 Task 3 Subtotal		**$4,736**

Task 4. Write Recovery Program summary report.

FY11 Task 4		
Labor-	Work days	Cost
Project Leader (400/day)	4	$1,600
Biologist (340/day)	8	$2,720
FY11 Task 4 Subtotal		**$4,320**

FY 2011 Total	**$62,494**

FY2011

Green River—Ouray, UT to Green River, UT, USFWS, Vernal

Task Activity	
Tasks 1-3	
Labor	
GS-11 Biologist trip prep ($38.26/hr x 8 hrs/day x 12 days)	$3,673
GS-8 Fisheries Tech trip prep ($33.25/hr x 8 hrs/day x 12 days)	$3,192
3 GS-5 Techs trip prep ($15.24/hr x 8 hrs/day x 12 days)	$4,389
White River confluence to Sandwash	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 2 days/trip x 3 trips) +	$1,836
($50.55/hr x 2 hrs OT x 2 days/trip x 3 trips)	$607
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 2 days/trip x 3 trips) +	$1,596
($49.88/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$599
3 GS-5 Tech ($15.24/hr x 8 hrs/day x 2 days/trip x 3 trips) +	$2,195
($22.86/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$823
Sandwash to Swaesys	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 5 days/trip x 3 trips) +	$4,591
($50.55/hr x 2 hrs OT x 5 days/trip x 3 trips)	$1,517
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 5 days/trip x 3 trips) +	$3,990
($49.88/hr x 2 hrs OT/day x 5 days/trip x 3 trips)	$1,496
3 GS-5 Tech ($15.24/hr x 8 hrs/day x 5 days/trip x 3 trips) +	$5,486
($22.86/hr x 2 hrs OT/day x 5 days/trip x 3 trips)	$2,057
Swaseys to Tusher diversion	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 1 days/trip x 3 trips) +	$918
($50.55/hr x 2 hrs OT x 1 days/trip x 3 trips)	$303
GS-5 Tech ($15.24/hr x 8 hrs/day x 1 days/trip x 3 trips) +	$366
($22.86/hr x 2 hrs OT/day x 1 days/trip x 3 trips)	$137
Subtotal	$39,772

Travel, Per Diem, Equipment	
Vernal to Ouray to Sandwash round trip (3 trucks/trip x 192 mi/truck x $0.505/mi x 3 trips)	$873
Shuttle Drivers Ouray to Sandwash round trip (3 trucks x $125/truck x 3 trips)	$1,125
Boat gas Ouray to Sandwash (12 gal gas/boat x $2.50/gal x 3 boats/day x 2 days/trip x 3 trips)	$540
Boat oil Ouray to Sandwash (2 qts. Oil/boat x $2.75/qt x 3 boats/day x 2 days/trip x 3 trips)	$99
Per diem Ouray to Sandwash (5 people/day x $25/person x 2 days/trip x 3 trips)	$750

Vernal to Sandwash to Swaseys round trip (3 trucks/trip x 448 mi/truck x $0.505/mi x 3 trips)	$2,036
Shuttle Drivers Sandwash to Swasey's round trip (3 trucks x $190 x 3 trips)	$1,710
Boat gas Sandwash to Swaseys (6 gal gas/boat x $2.50/gal x 3 boats/day x 5 days/trip x 3 trips)	$675
Boat oil Sandwash to Swaseys (1 qts. Oil/boat x $2.75/qt x 3 boats/day x 5 days/trip x 3 trips)	$124
Per diem Sandwash to Swaseys (5 people/day x $25/person x 5 days/trip x 3 trips)	$1,875
Vernal to Swaseys round trip (1 trucks/trip x 374 mi/truck x $0.505/mi x 3 trips)	$606
Equipment and supplies (nets, electrofishing gear, maintenance and repairs, boat motors, etc.)	$7,000
Subtotal	$17,413
Tasks 4-5	
Labor	
GS-11 Biologist trip prep ($38.26/hr x 8 hrs/day x 21 days)	$6,428
GS-9 Admin. Assist. ($36.73/hr x 8 hrs/day x 5 day)	$1,469
Supplies (paper, computer disks, copies, etc.)	$2,220
Subtotal	$10,117
Total	$67,301

FY2011

White River—Taylor Draw Dam to confluence with the Green River, USFWS, Vernal

Tasks 1-3	
Labor	
GS-11 Biologist trip prep ($38.26/hr x 8 hrs/day x 12 day)	$3,673
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 12 days)	$3,192
2 GS-5 Techs trip prep ($15.24/hr x 8 hrs/day x 6 days)	$1,463
Taylor Draw Dam to Rangely river bridge	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 1 day/trip x 3 trips)	$918
+ ($50.55/hr x 2 hrs OT x 1 day/trip x 3 trips)	$303
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 1 day/trip x 3 trips)	$798
+ ($49.88/hr x 2 hrs OT/day x 1 day/trip x 3 trips)	$299
2 GS-5 Tech ($15.24/hr x 8 hrs/day x 1 day/trip x 3 trips)	$732
+ ($22.86/hr x 2 hrs OT/day x 1 day/trip x 3 trips)	$274

Rangely river bridge to Pipeline	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,836
+ ($50.55/hr x 2 hrs OT x 2 days/trip x 3 trips)	$607
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,596
+ ($49.88/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$599
2 GS-5 Tech ($15.24/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,463
+ ($22.86/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$549
Pipeline to Enron (Cowboy Canyon)	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 3 day/trip x 3 trips)	$2,755
+ ($50.55/hr x 2 hrs OT x 3 day/trip x 3 trips)	$910
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 3 day/trip x 3 trips)	$2,394
+ ($49.88/hr x 2 hrs OT/day x 3 day/trip x 3 trips)	$898
3 GS-5 Tech ($15.24/hr x 8 hrs/day x 3 day/trip x 3 trips)	$3,292
+ ($22.86/hr x 2 hrs OT/day x 3 day/trip x 3 trips)	$1,234
Enron to Green River confluence	
GS-11 Biologist ($38.26/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,836
+ ($50.55/hr x 2 hrs OT x 2 days/trip x 3 trips)	$607
GS-8 Fisheries Tech ($33.25/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,596
+ ($49.88/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$599
2 GS-5 Tech ($15.24/hr x 8 hrs/day x 2 days/trip x 3 trips)	$1,463
+ ($22.86/hr x 2 hrs OT/day x 2 days/trip x 3 trips)	$549
Subtotal	$36,434

Travel, Per Diem, Equipment	
Vernal to Taylor Draw Dam round trip	
3 trucks/trip x 118 mi/truck x $0.505/mi x 3 trips	$536
Boat gas (6 gal gas/boat x $2.50/gal x 2 boats/day x 1 day/trip x 3 trips)	$90
Boat oil (1 qt. Oil/boat x $2.75/qt x 2 boats/day x 1 day/trip x 3 trips)	$17
Vernal to Rangely river bridge to pipeline round trip (2 day trips)	
3 trucks/trip x 273 mi/truck x $0.505/mi x 2 days/trip x 3 trips	$2,482
Boat gas (12 gal gas/boat x $2.50/gal x 2 boats/day x 2 days/trip x 3 trips)	$360
Boat oil (2 qts. Oil/boat x $2.75/qt x 2 boats/day x 2 days/trip x 3 trips)	$66
Vernal to pipeline/Enron (Cowboy Canyon) round trip	
3 trucks/trip x 161 mi/truck x $0.505/mi x 3 trips	$732
Shuttle Drivers (3 trucks/trip x $130/truck x 3 trips)	$1,170
Boat gas (6 gal gas/boat x $2.50/gal x 3 boats/day x 3 day/trip x 3 trips)	$405
Boat oil (1 qts. Oil/boat x $2.75/qt x 3 boats/day x 3 day/trip x 3 trips)	$74
Per diem (5 people/day x $25/person x 3 days/trip x 3 trips)	$1,125
Vernal to Enron to Green River confluence round trip	
3 trucks/trip x 194 mi/truck x $0.505/mi x 3 trips	$882
Boat gas (6 gal gas/boat x $2.50/gal x 3 boats/day x 2 days/trip x 3 trips)	$270
Boat oil (1 qts. Oil/boat x $2.75/qt x 3 boats/day x 2 days/trip x 3 trips)	$50

Equipment and supplies (nets, electrofishing gear, maintenance and repairs, boat motors, etc.)	$7,000
Subtotal	$15,258

Tasks 4-5

Labor	
GS-11 Biologist trip prep ($38.26/hr x 8 hrs/day x 20 day)	$6,122
GS-9 Admin. Assist. ($36.73/hr x 8 hrs/day x 5 day)	$1,469
Supplies (paper, computer disks, copies, etc.)	$350
Subtotal	$7,941
Total	$59,632

FY2011
lower Green River, Utah Division of Wildlife Resources, Moab

FY 2011 Costs:

Task 1-3	**Work Days**	**UDWR Moab**
Labor		
Proj. leader ($438/day)	20	$8,760
2 Biologist ($340/day)	90	$30,600
6 Technicians ($195/day)	300	$58,500
Travel		
Vehicle - 3 trips (5 trucks for 180 mi.and 12 days/trip)		$1,488
Per diem - 3 trips (10 days/ 7 people @ $25 per day)		$5,250
Equipment		
Camp gear repair and replacement		$750
Replace 2 - 16' aluminum Jon boats		$5,950
Boat, Trailer, Sampling gear repair and maintenance		$500
Boat/generator fuel, propane 3 trips		$1,350
Task 1 subtotal		$113,148
***Milage calculated as $0.42 per mile plus $5 per day*		

Task 4 - Sampling team coordination, data entry and analysis		**UDWR Moab**
Labor		
Biologist	5	$1,700
Task 4 subtotal		$1,700

Task 5 - Write Recovery Program Annual Report		**UDWR Moab**
Labor		
Biologist	5	$1,700
Task 5 subtotal		$1,700
FY 2011 TOTAL		**$116,548**

IX. Budget Summary

FY-2011	$ 391,165
Total:	$ 391,165

X. Reviewers: Dr. Richard Valdez, Dr. Paul Holden, Doug Osmundson

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