COLORADO RIVER RECOVERY PROGRAM
FY 2010 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 147

I. Project Title***: Standardization of Recovery Program Electrofishing Fleet***

II. Principal Investigator(s):

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III. Project Summary: To provide members of the Recovery Program's electrofishing fleet with information about electrofisher performance and control settings to achieve optimum power output to maximize fish capture while minimizing the likelihood of fish injury or mortality. Also, in FY 2011, to develop guidelines for standardizing electrofishishing raft electrode configurations to facilitate standard power output within conductivity range encountered in rivers of the upper Colorado River Basin (100-1000 µmhos). Additional benefits of this process should be to reduce catch variability among rafts and rivers, to improve comparability of data across rivers, reaches and species, and to maximize the catchability of target fishes.

IV. Study Schedule: Initial year: 2010 Final Year: 2010.

V. Relationship to RIPRAP:

- General Recovery Program Support Action Plan
  - V.A. Measure and document population parameters to determine status and biological response to recovery actions.
  - V.A. 2. Evaluate population estimates.
  - V.C. Develop and enhance scientific techniques required to complete recovery actions.
  - V.D. Establish sampling procedures to minimize adverse impacts to endangered fishes.
  - V.D.2. Implement scientific sampling protocols to minimize mortality for all endangered fish.

VI. Accomplishment of FY 2010 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

The electrical characteristics for the VVP 15B, GPP 5.0 and ETS MBS electroshockers

were tested by connecting them to static loads of approximately 6 to 200 ohms. The peak output voltage and current were measured with an oscilloscope at specific values of load resistance for the calculation of the peak output power. No attempts were made to record the variations in the pulsed waveforms as the values of load resistances were changed. In general, as the electrical loading increased (lower resistance values), the pulsed dc waveforms would demonstrate frequency and amplitude instability before the electroshocking units actually overloaded and ceased to operate. The electroshockers were only tested at 60 Hz.

The power levels calculated for the VVP 15B definitely indicate the marginal capabilities of this unit with the standardized aluminum electrofishing boats. To effectively use this electrofisher, the electrodes would have to be size selected per the conductivity of the water being fished. This electrofisher was successfully tested at a 10% duty cycle but consistently overloaded at 20%.

The ETS unit demonstrates a linear voltage versus resistance characteristic for both the 600 V and 300 V ranges. The unit overloaded on the 600 volt range at about 15 ohms, but the 300 volt range (obviously designed to operate in high conductivity waters less then 15 ohms) extended the operation to about 6 ohms. The ETS was successfully tested at 10 and 20% duty cycles, and operation at 20% is encouraging for initiating electrotaxis. Perhaps the greatest limitation of the ETS is the 600 volt maximum when fishing in low conductivity water. This limitation can be remedied by changing the size of the electrodes.

The GPP 5.0 developed higher power than the ETS or VVP 15B. In fact, the excess power might appear as a comfortable margin for deciding that this is the electroshocking unit of choice. However, this high power level was measured with the percent of range (POR) at 50 % and a corresponding duty cycle of about 18%. The concern is that this high power is probably excessive and may be detrimental and cause injury to the fish. However, if the GPP power is reduced by the POR control, there is a corresponding loss of duty cycle and diminished electrotaxis. By offering an independent duty cycle control, the ETS electroshocker eliminates this enigma.

Preview of FY 2011 work: Information on Upper Colorado River Basin and San Juan River Basin Recovery Program electrofishing rafts was requested and received from the five field stations that employ rafts to sample fish within critical habitat for endangered fishes (Table 1). The electrical system resistance of four rafts from different field stations having variable cathode configurations (but using a single 9-inch diameter stainless steel spherical anode with similar perforations) was tested at Highline Lake, Colorado in November and December, 2010. Initial examination of the data indicate a system resistance among these rafts of ~140Ω, with a distribution of ~120Ω in the anode and 20Ω in the cathode at 100µS/cm.

VII. Recommendations:

The results for the ETS units during these static load tests are certainly positive. However, field personnel are probably in the best position to evaluate whether the GPP or the ETS electroshockers are the better units for the Recovery Program. Additionally, we do not have a history regarding the reliability of the ETS units or how they will be supported when in need of repairs. If funds are available, it is recommended that the Recovery Program purchase a couple of the ETS units for field testing.

Preview of FY 2011 findings: The distance between the anodes and cathodes on the electrofishing rafts tested was sufficient to avoid any interference with the electrical output of the anode. However, comparison of cathode configurations, broom-style vs. fan-style deployment of the cable strands, indicates that the fan-style cathode, with separated cable strands, increases the percentage of power distributed to the anode. This separation of fewer cable strands in the fan-configuration appears to improve cathodic surface area and electrical performance in comparison to multiple cable strands bundled in the broom-style which would tend to function electrically as a cylinder when trailing the raft. It is recommended that the raft electrofishing fleet adopt a fan-style cathode consisting of four strands of 0.25-inch diameter stainless steel cable of a length that allows 46-inches of each cable strand to be submerged in the water while trailing the raft.

VIII. Project Status: Project is on track and ongoing.

IX. FY 2010 Budget Status

A. Funds Provided: $4,000.
B. Funds Expended: $3,175.
C. Difference: $825.
D. Percent of the FY 2010 work completed, and projected costs to complete: 100% of work completed.

E. Recovery Program funds spent for publication charges: $0

X. Status of Data Submission (Where applicable): Not applicable.

XI. Signed: *Patrick J. Martinez* December 2, 2010

Principal Investigator Date

Table 1. Summary of specifications for 14 electrofishing rafts used/shared by five field stations in the Upper Colorado River Basin and San Juan River Basin Recovery Programs to sample fish within critical habitat for endangered fishes.

Critical Habitat Electrofishing Raft Measurements By Station Using Smith Root GPP 5.0 Electrofisher								
Station	**CDOW**	**UDWR**			**USFWS**			
	Grand Jct, CO	**Moab, UT**			**Grand Jct, CO**	**Vernal, UT**	**Albuquerque, NM**	
Raft Type	Down River	NRS	NRS	NRS	NRS	NRS	Avon	Avon
Raft Name or ID	Lori's 1&2	Expedition 1&2	Kodiak Cat 1	Kodiak Cat 12	Expedition 1,2&3	Gila&Cactus Ed	Blisters&Dimples	Old Raft
# of Identical Rafts	2	2	1	1	3	2	2	1
Full Length of Raft	16 ft.	14 ft.	16 ft.	14 ft.	16 ft.	16 ft.	16 ft.	14 ft.
Max Width of Raft	90"	80"	94"	94"	93"	90"	84"	84"
SS Sphere Diameter	10"	9"	9"	9"	10"	9"	9"	9"
Sphere Metal Type	SS	SS	SS	SS	SS	SS	SS	SS
Submergence	50%-75%	50%-75%	50%-75%	50%-75%	50%	50%	75%-100%	50%-75%
Sphere to Bow	68"	64"	50"	50"	48"	72"	48"	40"
Sphere to Cathode	220	228"	218"	218"	184"	192"	216"	195"
# of Anodes	1	1	1	1	1	1	1	1
# of Cathodes	2	2	2	2	2	2	2	2
Separation of Cathodes	90"	80"	94"	80"	93"	84"	84"	65"
Cathode Metal Type/Size	Ssteel 1/4"	SSteel 1/8"	SSteel 1/8"	SSteel 1/8"	SSteel 1/8"	CSteel 1/4"	SSteel 1/8"	SSteel 1/8"
Cathode Style	Fan	Broom	Broom	Broom	Broom	Fan	Broom	Broom
# of Strands/Cathode	3	10	10	10	15	10	15	5
Length of Strands/Cathode	46"	36"	36"	36"	68"	40"	72"	60"
***CDOW and USFWS (Grand Junction) 10" sphere's were fitted with a 9" sphere for analyses								