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March 17, 2011

Ms. Alice Lawrence,
U. S. Fish and Wildlife Service
Westpark Center, Suite D
105 Westpark Drive
Athens, Georgia 30606

Dear Ms. Lawrence:

The enclosed is a summary of the conservation actions conducted during 2010 for the Candidate Conservation Agreement with Assurances for the Robust Redhorse, *Moxostoma robustum*, Ocmulgee River, Georgia, (CCAA) as described in Agreement Number 1448-40181-01-K-005. This report summarizes activities conducted during 2009 towards fulfillment of phases 1 and 2 of the CCAA. Specific activities addressed include monitoring the abundance and distribution of introduced robust redhorse (Conservation Action 3) and monitoring the adult population in the Ocmulgee River and estimating population size (Conservation Action 4), as a result of our January 2008 modification to the CCAA.

Please contact me at 404-799-2159 if you have further questions regarding this report.

Sincerely,

Joe E. Slaughter, IV
Fisheries Biologist
Georgia Power Company

March 17, 2011
CCAA 2009 Progress Report
1448-40181-01-K-005

XC:
With attachments.

Jimmy Evans, Georgia Department of Natural Resources
Cecil Jennings, USGS Georgia Cooperative Fish and Wildlife Research Unit
Ryan Heise, Chairman Robust Redhorse Conservation Committee
Hallie Meushaw, Troutman Sanders
Joel Galt, Southern Company Generation, Hydro Services
Greg Brown, Georgia Power
Cheryl Wheeler, Georgia Power
Mike Phillips, Georgia Power

2010 Progress Report: Candidate Conservation Agreement with Assurances for the Robust Redhorse, *Moxostoma robustum*, Ocmulgee River, Georgia

Agreement Number 1448-40181-01-K-005

Conservation Action 1. *Georgia DNR will stock the Project Site with approximately 4,000 hatchery-reared robust redhorse fingerlings each year for five years.*

> On January 3, 2008, the FWS issued a modification to the CCAA, which allows GPC to move forward with Conservation Actions 3 and 4 under the Adaptive Management provision without reaching the original stocking target of 20,000 fingerlings. As such, no formal stocking program is currently underway, and the final stocking event (26 individuals from five year classes representing the last of the adult captive broodstock at Warm Springs FNH) took place in 2009.

Conservation Action 2. *Georgia Power will fund two surveys, one in year 1 (2002) and one in year 3 (2004) on the movement of introduced juvenile robust redhorse.*

> A third movement survey was completed in 2008 by UGA, and the final report from that study was submitted with the 2007-08 update. Given the completion of the two prescribed studies and the additional 2008 study, we believe there are no further requirements related to this Conservation Action.

Conservation Action 3. *Georgia Power will conduct or fund six surveys in order to monitor abundance and distribution of juvenile and adult robust redhorse within Project Site.*

> The fifth and sixth monitoring surveys under Conservation Action 3 are scheduled for 2010-2011 and will be conducted in conjunction with adult population surveys outlined in Conservation Action 4 and through a large-scale research study conducted by Dr. Cecil Jennings with USGS and funded by GPC. Appendix A includes the study progress report describing project activities conducted in 2010.

Conservation Action 4. *Following the establishment of an adult refugial population in the Project Site, Georgia Power will fund three surveys to measure population size utilizing the mark-recapture methods used to estimate the population size of the Oconee River robust redhorse population.*

> As stated above, GPC and USGS entered into a research contract to conduct intensive monitoring surveys in the Ocmulgee River between Lloyd Shoals Dam and the East Juliette low-head dam. That study began in 2010, and preliminary results from the first year of the project are included in Appendix A.

Appendix A.

Use of hierarchical occupancy models to determine seasonal habitat use and estimate abundance on stocked robust redhorse in the upper reaches of the Ocmulgee River, Georgia

Progress Report

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Submitted to

Georgia Power Company

7 March 2011

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Introduction

A multi-stakeholder Candidate Conservation Agreement with Assurances (CCAA) was formed between Georgia Power Company, Georgia Department of Natural Resources, and the U.S. Fish and Wildlife Service and implemented in 2002. The project site covered by the CCAA includes the upper reaches of the Ocmulgee River, GA, between Lloyd Shoals Dam (A Georgia Power Company owned and operated hydropower facility impounding Jackson Lake) and a low head mill dam near Juliette, GA. The two main objectives of the CCAA are (1) to establish a refugial population of robust redhorse within the upper reaches of the Ocmulgee River, and (2) increase understanding of habitat requirements and life history of robust redhorse. Conservation actions outlined in the CCAA to achieve the above objectives include: (1) stock the project site with fingerling robust redhorse, (2) study the movement of stocked juveniles, (3) monitor abundance and distribution, and (4) estimate population size. These actions and studies to examine movements, abundance, distributions and population size of the stocked population are to continue until scientific evidence concludes that the Ocmulgee population does not need additional augmentation or monitoring (Department of Interior 2001).

To date, research within the project site has included the investigation of post-stocking habitat use and dispersal (Jennings and Shepard 2003), spawning migration and seasonal habitat use of stocked fish (Grabowski and Jennings, 2009), and the determination of robust redhorse capture probability (Grabowski et al. 2009). These studies examine conservation actions 1, 2, and a portion of 3. Our current study focuses on actions 3 and 4. The objectives of the current study include: (1) determine seasonal habitat use, (2) estimate abundance of robust redhorse, (3) determine the utility of hierarchical occupancy models for determining seasonal habitat use and

estimating the abundance, and (4) provide a modeling framework that can be continuously updated or modified with data gathered during subsequent robust redhorse monitoring studies.

Detection probability for robust redhorse in the Ocmulgee River is extremely low (0.031; Grabowski et al.'s 2009). The low detection probability of a rare or elusive species is often the result of a phenomenon called imperfect detection. Imperfect detection refers to researcher's inability to detect all individuals (or species) within a study site (MacKenzie 2005). Imperfect detection often results from the rarity or cryptic nature (coloration or behavioral) of the species or the tendency of that species to inhabit areas that are difficult to sample. The use of site occupancy to determine a species' resource use is used mostly when species detection probability is very low, and such is the case for robust redhorse. Site occupancy is the determination that a species of interest inhabits a particular resource unit, and this occupancy is often some function of spatial location or various habitat characteristics that define that unit (see synthesis by MacKenzie et al., 2002; MacKenzie, 2005; MacKenzie, 2006).

Methods

All accessible portions of the project area between Lloyd Shoals Dam and Juliette Dam were sampled seasonally with standard boat electrofishing gear in accordance with survey sampling protocol outlined by the Robust Redhorse Conservation Committee (2002). The accessible portions of the project area has been stratified into 25 sample units based on mesohabitat (e.g., shoal, run, pool) and local habitat characteristics (e.g., substrate composition, local water velocity, average depth, quantity of woody debris). Each sampling unit was sampled via boat electrofishing at least twice per season for four seasons (Spring '10, Summer '10, Fall '10, and Spring '11). During each sampling occasion, data on environmental variables (e.g.,

water temperature, dissolved oxygen, turbidity or secchi depth, discharge) were collected and recorded. Combinations of the above variables were used as predictor variables for our occupancy models.

Each robust redhorse captured was checked for coded wire tags and Passive Integrated Transponder (PIT) tags, and implanted with a new PIT tag if one was not detected. Each captured individual's total length (mm) and weight (g) as well as gender, breeding condition or anomalies were recorded. Additionally, other Catostomids encountered during the sampling were weight and measured; data on habitat use and habitat associations also were recorded. Occupancy data gathered from other suckers, especially those found in close association with robust redhorse, will be used in our hierarchical modeling framework. Occupancy models will be constructed using specialized computer software WinBUGS (available at http://www.mrc-bsu.cam.ac.uk/bugs/).

Preliminary Results and Discussion

During the Spring '10 and Summer '10 seasons, robust redhorse were detected in the first and second sampling occasions in the sample site immediately below Lloyd Shoals Dam (dates: May 10, May 24, June 30, August 3). On May 10, a spawning group of 6-8 individuals was found over shoals immediately below the dam with water being released (82 m^3/ second). This set of shoals frequently is <1ft deep during times of low water discharge (9 – 13 m^3/second) from the dam found during the summer and fall seasons. The other three detections were visual detections (e.g., fish were affected by electrofishing, but were unable to be netted), in either in the deep, fast, water of the dam's tailrace or just below the shoals adjacent to the Georgia Power boat ramp and picnic area. Robust redhorse were not detected in the Fall '10 season. Thus far,

robust redhorse have not been detected in any other portions of the project site during any sampling occasions. A total of seven suckers species have been detected during the study. The numbers of captures thus far have ranged from 2029 (notchlip redhorse) and 1003 (spotted sucker) to 2 (robust redhorse, highfin carpsucker) or less (1 total captures quillback carpsucker) (Table 1). There were several individual from many species that were seen (i.e., detected), but not netted.

Seven, simple hierarchical occupancy models were constructed for the sampling seasons thus far. The models were constructed with water velocity, discharge, secchi depth, and various combinations of the three as predictor variables. Of these seven, the best-predicting model for site occupancy and calculating detection probabilities was the discharge + secchi model. Using this model, we were able to calculate the average conditional detection probabilities (the probability of detecting the species, given it is present in the sample site) for five of the most commonly encountered sucker species encountered in the 2010 sampling seasons. On average across all sampling seasons, robust redhorse detection probability was the lowest at 0.025 (Table 2). Conversely, the high average detection probabilities of notchlip redhorse and spotted suckers (0.957 and 0.981 respectively) are a direct result of the abundance and presence at nearly every sample site (Table 2).

Robust redhorse have an extremely low detection probability regardless of season (Table 2). The fall detection probability (0.012) was much lower than for spring (0.024) and summer (0.040) seasons because robust redhorse were not detected during the fall. However, the spring and summer detection probabilities are much closer to the 0.031 capture probability reported by Graboswki et al. (2009). This conditional detection probability is averaged across all sites in the project site, but is not site-specific. Robust redhorse were detected in four of six sampling

occasions in the sample site below Lloyd Shoals Dam resulted. Site-specific detection probability for this site or sites exhibiting similar habitat characteristics may be much higher than our current estimates suggest.

Robust redhorse were only detected in a site that was predominantly shoal habitat, with large amounts of rocks, boulders, gravel deposits, and high water velocities, usually 0.6 – 0.8 m/second. However, only a small portion of accessible portions of the river exhibit these same characteristics. Most of these reaches, including an 8 km reach are in inaccessible and were not sampled. Approximately 1 km of the downstream end of this 8 km reach is able to be sampled, but only in times of high discharge (a minimum of 87 m^3/ second) and this value was rarely reached during our sampling occasions. This 8 km portion of the river contains abundant shoals that probably support robust redhorse. The entire project site between Lloyd Shoals Dam and Juliette dam contains approximately 19% shoal habitat. However, only ~ 3.5% of this habitat was able to be sampled during the study thus far. The project is ongoing, and plans are underway for the Spring 2011 sampling.

The Spring ’11 sampling season will commence in March and continue through the spawning period into May. Additional and more complex models will be constructed to incorporate the low detection probability. The new models will incorporate additional habitat data and their various combinations and interactions. Our intent is to find the best approximating model for determining robust redhorse site occupancy, site-specific detection probabilities, and estimate the current population status of robust redhorse.

Literature Cited

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Table 1**.** Total number of suckers captured during the 2010 sampling for robust redhorse in the Ocmulgee River, GA between Lloyd Shoals Dam and Juliette Dam.

Species	Spring	Summer	Fall	Total
Quillback carpsucker *Cyprinus sp.cf. carpioides*	1	0	0	1
Highfin carpsucker *Cyprinus sp. cf. vellifer*	2	0	0	2
Spotted sucker *Minytrema melanops*	440	207	356	1003
Notchlip redhorse *Moxostoma collapsum*	623	572	834	2029
Robust redhorse *Moxostoma robustum*	2	0	0	2
Striped jumprock *Scartomyzon rupricartes*	5	4	27	36
Brassy jumprock *Scartomyzon sp. cf. lachneri*	154	63	50	267

Table 2. Average conditional detection probabilities for the five most encountered sucker species detected during the 2010 sampling of robust redhorse in the Ocmulgee River, GA between Lloyd Shoals Dam and Juliette Dam.

Species	Spring	Summer	Fall	Mean
Robust redhorse *Moxostoma robustum*	0.024	0.040	0.012	0.025
Notchlip redhorse *Moxotoma collapsum*	0.999	0.933	0.939	0.957
Spotted sucker *Minytrema melanops*	0.999	0.944	0.999	0.981
Striped jumprock *Scartomyzon rupricartes*	0.892	0.599	0.470	0.654
Brassy jumprock *Scartomyzon sp. cf. lachneri*	0.999	0.811	0.989	0.933