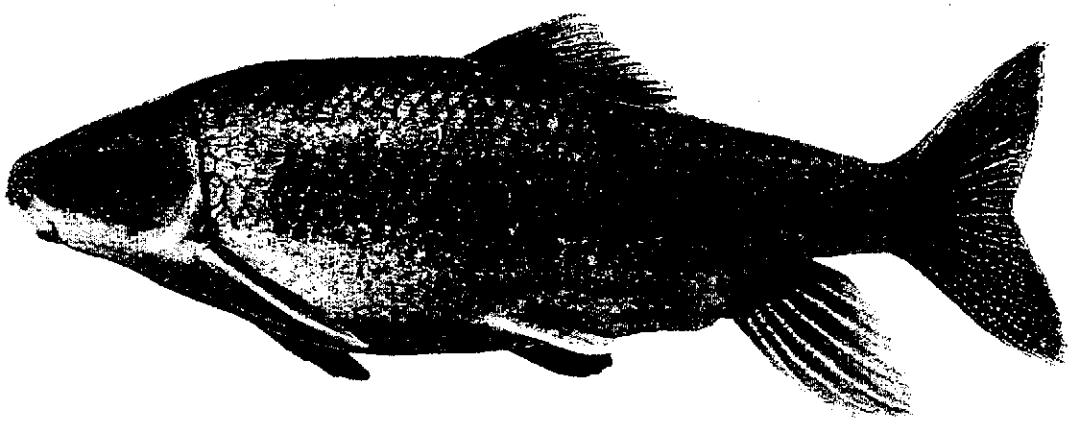
Candidate Conservation Agreement with Assurances for the Robust Redhorse Ocmulgee River, Georgia



Robust Redhorse (*Moxostoma robustum*) Dr. B. J. Freeman, Institute of Ecology, University of Georgia

Georgia Power Company
Georgia Department of Natural Resources
U. S. Fish and Wildlife Service

CANDIDATE CONSERVATION AGREEMENT WITH ASSURANCES

for the Robust Redhorse, *Moxostoma robustum*, Ocmulgee River, Georgia

Agreement Number 1448-40181-01-K-005

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I. INTRODUCTION

This Candidate Conservation Agreement with Assurances (Agreement) for the robust redhorse, *Moxostoma robustum*, has been developed as a collaborative effort between the private sector, and State and Federal resource agencies in order to expedite the reintroduction of the robust redhorse into the Ocmulgee River. The conservation actions specified in the Agreement will be implemented in accordance with the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 *et seq.*) (ESA), the U.S. Fish and Wildlife Service's Final Policy for Candidate Conservation Agreements with Assurances (64 Federal Register 32726-32736) (Final Policy), and 50 C.F.R. §§ 13 and 17. The goals and objectives of this Agreement will be accomplished through implementation of the conservation actions set forth in this Agreement. Successful implementation of this Agreement will expand the limited range of the robust redhorse, which is currently believed to be the most imminent threat to the species.

This Agreement, effective and binding on the date of the last signature below, is between Georgia Power Company (Georgia Power), the U.S. Fish and Wildlife Service (Service), and the Georgia Department of Natural Resources, Wildlife Resources Division (GADNR). Georgia Power, the Service, and the GADNR are collectively the "Parties" to this Agreement.

Property Owner: Georgia Power designates the following individual as the contact for this Agreement:

Michael C. Nichols
Environmental Laboratory Manager
5131 Maner Road
Smyrna, GA 30080

Cooperator: David Waller, Director
Georgia Department of Natural Resources
Wildlife Resources Division
2070 U.S. Hwy 278, S.E.
Social Circle, GA 30279

The GADNR designates the following individual as the contact for this Agreement:

Jimmy Evans, Senior Fisheries Biologist
Fisheries Section
1014 Martin Luther King Blvd.
Fort Valley, Georgia 31030

Service: The Service designates the following individual as the Agreement Administrator:

Sandy Tucker, Field Supervisor
U.S. Fish and Wildlife Service
257 South Milledge Avenue
Athens, Georgia 30605

This Agreement covers the following property:

That portion of the Ocmulgee River, Georgia, lying between river miles 230.9 and 250.2, bounded on the downstream end by a low head dam at Juliette, Georgia, and on the upstream end by Lloyd Shoals Dam, a Georgia Power hydroelectric facility.

II. AUTHORITY and PURPOSE

Sections 2, 7, and 10 of the ESA authorize the Service to enter into this Agreement. Section 2 of the ESA states that encouraging interested parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs is essential to safeguarding the Nation's heritage in fish, wildlife and plants. Section 7 of the ESA requires the Service to review the programs it administers and utilize those programs to further the purposes of the ESA. By entering into this Agreement, the Service is utilizing its Candidate Conservation Programs to further the conservation of the Nation's fish and wildlife. Section 10(a)(1)(A) of the ESA and its implementing regulations authorize the issuance of "enhancement of survival" permits (Permit) for proposed and candidate species and those species which may become candidates in the future.

The purpose of this Agreement is to implement conservation measures for the robust redhorse (*Moxostoma robustum*) through the reintroduction, monitoring, and research described in the Conservation Actions section of this Agreement. In particular, the proposed reintroduction is expected to expand the range of the robust redhorse.

The use of a Candidate Conservation Agreement with Assurances is appropriate even though the robust redhorse is not listed as a formal candidate species by the Service. In providing for Candidate Conservation Agreements with Assurances, the Service did not intend to exclude species that are not officially listed as candidate species, but are nevertheless at risk if populations decline (see the Final Policy, page 32732). Instead, the Service recognizes that taking steps before a species enters a serious decline is often the most effective way to conserve that species, thereby possibly precluding the need to list the species under the ESA.

All Parties to this Agreement recognize that they have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of natural resources, and the management, development and allocation of water resources. Nothing in this Agreement is intended to abrogate any of the Parties' respective responsibilities. This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws.

III. EXPECTED BENEFITS

This Agreement is expected to benefit the robust redhorse by initiating research on juvenile and young adult migration and by establishing a refugial population in the Project Site. In addition, the Conservation Actions described in this Agreement are eventually expected to result in a self-sustaining robust redhorse population within the Project Site. The Parties used the best scientific data available regarding the life history, biology, and known habitat requirements of the robust redhorse in selecting the Project Site and establishing Conservation Actions to benefit the robust redhorse.

The Parties believe the following objectives are reasonable and that they will help to eliminate or significantly reduce threats to the robust redhorse contributing to the long-term conservation of the species. The benefits of the specific conservation measures described in this Agreement, when combined with those benefits that would be achieved if it is assumed that the conservation measures were also implemented on other necessary properties, are expected to help preclude or remove any need to list the robust redhorse. These objectives are specific to this Agreement:

Objective 1 - Establish a refugial population of robust redhorse in the Project Site.
Through this objective, the Parties will attempt to establish sufficient numbers of robust redhorse within the Project Site to ensure long-term survival of a refugial population through propagation, population augmentation, and monitoring. By doing so, the parties expect to reduce potential threats to the species in the event of the catastrophic loss of any of the known native populations and provide the foundation necessary for a self-sustaining population within the Project Site.

Objective 2 - Increase understanding of habitat requirements and life history of robust redhorse.
Through this objective, the Parties will, through scientific study and surveys, identify habitats utilized by juvenile robust redhorse, potential migratory movements of juvenile robust redhorse, and spawning and other important habitats.

These objectives will be accomplished through implementation of the specific conservation measures set for the Agreement. However, in accordance with the principles of adaptive management, which are discussed herein, the status of this Agreement will be evaluated to assess the Agreement's success.

IV. ADDITIONAL BENEFITS

The primary focus of this Agreement is the creation and maintenance of a new robust redhorse population within the Project Site. The knowledge acquired through implementation of this Agreement can be used to help establish other refugial and self-sustaining populations of robust redhorse in other portions of its range. In doing so, this Agreement can serve as an example to others wishing to participate in robust redhorse conservation and recovery, effectively facilitating

additional recovery efforts throughout the species' historic range. This Agreement could also serve as a model for similar conservation efforts for other imperiled species.

V. PARTIES

1. Georgia Department of Natural Resources
Wildlife Resources Division
2070 U.S. Hwy 278, S.E.
Social Circle, GA 30279

The GADNR works to sustain, enhance, protect, and conserve Georgia's natural, historic, and cultural resources for present and future generations. The GADNR is a cooperator to this Agreement. In its role as a cooperator, the GADNR does not require the ESA regulatory assurances typically provided under the Final Policy for Candidate Conservation Agreements with Assurances and will not receive those assurances under this Agreement. GADNR's participation will provide the close coordination with the State that is required by the Final Policy and will ensure that the Agreement is consistent with applicable State laws and regulations. The GADNR has provided funding, personnel, and other in-kind services to further the conservation of the robust redhorse.

2. Georgia Power Company
Environmental Affairs
241 Ralph McGill Blvd N.E.
Atlanta, GA 30308-3374

Georgia Power Company, a public electric utility, has already provided approximately $1,000,000 in research funding as well as personnel and other services to support robust redhorse conservation. Georgia Power is the owner and operator of Lloyd Shoals Dam, which regulates river flows within the Project Site.

3. U. S. Fish and Wildlife Service
Ecological Services Program
1875 Century Boulevard
Atlanta, Georgia 30345

The Service works to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. The Service is committed to expanded partnerships, which offer innovative opportunities to enhance fish and wildlife resources. The Service has provided funding, personnel, and other in-kind services to further the conservation of the robust redhorse.

VI. DEFINITIONS

The following definitions apply to this Agreement:

Enhancement of Survival Permit (Permit) - The permit issued by the Service to Georgia Power, effective on the date the robust redhorse is listed as endangered or threatened under the ESA, or in some other manner becomes subject to the ESA, allowing Georgia Power to engage in the incidental taking (as defined in 50 C.F.R. § 17.3, as it may be hereinafter amended) of robust redhorse, pursuant to 16 U.S.C. § 1539(a)(1)(A).

License - The license (No. 2336-009) issued by the Federal Energy Regulatory Commission (FERC) to Georgia Power authorizing Georgia Power to operate the Lloyd Shoals Dam (see Order Issuing New License, 62 FERC ¶ 62,201 (1993)). The License term is for 30 years and will expire January 1, 2023.

Lloyd Shoals Dam - Located in Georgia at river mile 250.2 on the Ocmulgee River in Butts and Jasper Counties, this hydroelectric facility, FERC Project No. 2336-009, is owned and operated by Georgia Power pursuant to Order Issuing New License, 62 FERC ¶ 62,201 (1993).

Project Site - The Ocmulgee River between river miles 230.9 and 250.2, bounded on the downstream end by a low head dam at Juliette, Georgia (FERC Project 7019), and on the upstream end by Lloyd Shoals Dam (FERC Project 2336-009).

Refugial Population - An introduced population of adult robust redhorse from which brood stock can be obtained for future propagation. The purpose of establishing refugial populations is to reduce the risk of losing the species because of the species' limited, known range and possible catastrophic events. A refugial population may or may not be a self-sustaining population.

Robust Redhorse Conservation Strategy - A document that describes the status and distribution of the robust redhorse, discusses problems facing the species, and describes conservation actions necessary to improve the species' status across the historic range. This strategy was developed by a 12-member stakeholder partnership, the Robust Redhorse Conservation Committee (RRCC), to guide research on the biology and status of the species and the establishment of reproducing populations within its historic range. The strategy was adopted by the RRCC on May 1, 2000.

Self-sustaining Population - A population of robust redhorse exhibiting successful recruitment to the adult population. Successful recruitment means reproduction and growth over a period of years to maintain robust redhorse genetic diversity and population numbers for a specific reach of river. It is currently believed that robust redhorse are sexually mature after six years. Genetic diversity refers to the ability of the population gene pool to respond to long term changes in the environment and reduce the frequency of expression of deleterious traits.

VII. BACKGROUND

The "Robust Redhorse Conservation Strategy" dated May 1, 2000, is included as Appendix I of the Agreement and contains detailed information on the robust redhorse and ongoing conservation activities. The Conservation Strategy, as it may be amended in the future, is hereby incorporated into this Agreement by reference.

1. Species Description

The robust redhorse is a large, heavy-bodied sucker that attains total lengths greater than 700 mm and weights up to 8 kg. This species has large molariform pharyngeal teeth specialized for crushing hard-bodied prey, such as mussels, and is the only sucker species within its range with this character. The robust redhorse is bronze on the back and sides becoming pale or white ventrally. Juveniles will have intense red in the caudal fin, which becomes less distinctive in adults. Adult males develop large tubercles on the snout and head during the spawning season.

2. Life History

The robust redhorse spawns during April, May, and June when water temperatures reach 21 to 23 degrees Celsius. Spawning is typical of *Moxostoma* and involves spawning triads with two males fertilizing the eggs of a single female which are deposited in gravel bars. The life span of the robust redhorse is not currently known, but the oldest specimen collected to date was 27 years old (Jenkins, unpublished data). The robust redhorse is apparently a long-lived fish. It may take five to six years for stocked individuals to reach sexual maturity and begin spawning.

Studies of the species' diet are limited to field observations made during surveys and broodfish collection efforts. The few Oconee River specimens examined suggest that adult fish feed primarily on bivalves, including the Asian clam, *Corbicula* sp., an invasive species. Feeding habits and preferences of juvenile robust redhorse are poorly understood.

3. Habitat

The robust redhorse inhabits southeastern Piedmont Plateau and upper Coastal Plain sections of large South Atlantic slope rivers. Piedmont reaches are characterized by rock shoals, outcrops, and pools, particularly along the Fall Line. The upper Coastal Plain reaches typically have sandy banks and beds interspersed with a few shoals and occasional gravel bars. The upper Coastal Plain reaches also have extensive networks of swamps, oxbows, and floodplains. Woody debris and fallen trees seem to provide preferred habitat for adult robust redhorse in the Oconee River, and clean gravel bars are necessary for spawning and development of larval fish.

4. Distribution

The historic range of the robust redhorse includes Atlantic Slope drainages from the Pee Dee River in North Carolina to the Altamaha River in Georgia. The largest known population occurs in the Oconee River between Dublin, Georgia, and Big Black Creek and is estimated to consist of 600 adult fish (Jennings *et al.*, 2000). With the recent discovery of native populations in the Pee Dee River, North and South Carolina, the lower Ocmulgee River, Georgia, and the Savannah River, South Carolina and Georgia, there are four known native populations. Preliminary data on the three recently discovered populations do not allow reliable population estimates at the time of this Agreement.

The GADNR, with the assistance of the RRCC, has reintroduced robust redhorse, which were obtained from propagation efforts using adults from the Oconee River population, into the Broad and Ogeechee rivers, Georgia, from 1996 to 2000. Subsequent sampling of these rivers has confirmed that the initial stocking was successful and adults were recaptured on the Broad River in 2001. The recaptured fish represent a significant development in that the stocked fish are surviving and maturing.

VIII. PROBLEMS FACING THE SPECIES

The success of any conservation or recovery effort depends on reducing or eliminating threats to the continued existence of the species. The Service uses five criteria defined in section 4(a)(1) of the ESA to evaluate threats to species, and these criteria are briefly addressed below as they relate to current threats to the robust redhorse. In addition, the "Robust Redhorse Conservation Strategy" (see Appendix I) contains additional information concerning the threats to the species.

The limited range of the species and the historical loss of suitable habitat are the primary factors affecting the decline of the robust redhorse. The construction of dams in the 1950's and 1960's reduced available spawning habitat and altered natural stream flows. Historic land use practices, including intensive agriculture and deforestation, also played a major role in the degradation of riverine habitats through erosion and sedimentation. There is currently no evidence to support overutilization, exploitation, or disease as contributing factors to the decline of the species. The flathead catfish, a predatory species introduced to the lower Ocmulgee River and High Falls Lake, has been identified as a potential threat to the robust redhorse, but has not become established in the Project Site.

There are currently no identified inadequacies in existing regulatory mechanisms. The robust redhorse is protected by the State of Georgia as an endangered species and is a species of management concern for the Service. Existing State and Federal laws serve to protect robust redhorse and its habitat including the Lacy Act, the Federal Water Pollution Control Act (Clean Water Act), the Fish and Wildlife Coordination Act, the National Environmental Policy Act, the Federal Power Act, and the Rivers and Harbors Act. Erosion and sedimentation regulations are

in place and best management practices can help protect existing habitat. No other natural or manmade threats to the robust redhorse have been identified.

In summary, the limited geographic range of the robust redhorse and the presumed low numbers of wild individuals are considered to be the most serious threats facing the species. These threats are compounded by gaps in our understanding of life history requirements for the robust redhorse, particularly the habitat requirements of juveniles. This Agreement will create the third reintroduced population and allow the collection of additional information to fill these gaps in our understanding of this species.

IX. DESCRIPTION OF THE PROJECT SITE

1. Project Site

The Project Site includes approximately 19 miles of stream channel in the Ocmulgee River, between Lloyd Shoals Dam and a low head dam at Juliette, Georgia, between river miles 250.2 and 230.9. The Project Site is within the Altamaha River drainage and is approximately 120 river miles from the Ocmulgee River's confluence with the Oconee River. The watershed above Lloyd Shoals Dam encompasses approximately 1,492 square miles and is largely urban. Lloyd Shoals Dam, which impounds Jackson Lake, provides peaking power to meet electrical power demands. Several tributaries enter the Project Site, however, they provide limited habitat value for robust redhorse and are not part of the Project Site.

2. Water Quality and Quantity

Although there are known water quality problems upstream of the Project Site, the Parties believe these problems do not represent significant threats to the establishment of a robust redhorse population within the Project Site. The lake impounded by Lloyd Shoals Dam, Jackson Lake, may improve water quality within the Project Site by trapping sediment washed downstream from the developed portion of the watershed. In addition, a weir immediately downstream of Lloyd Shoal Dam greatly improves dissolved oxygen concentrations in the Ocmulgee River (Hendricks 1997), such that the waters of the Ocmulgee River between Lloyd Shoals Dam and the Towaliga River at river mile 233.1 meet the water quality criteria established by the State of Georgia for fishing. The water quality improvements in this portion of the Ocmulgee River have increased the diversity of the existing riverine fish community, and helped expand the distribution of important sport fish species (J. Evans, GADNR, personal communication).

Fishery and in-stream flow studies were conducted within the Project Site during the late 1980's and early 1990's as part of the Federal Energy Regulatory Commission (FERC) relicensing of the Lloyd Shoals Dam. These studies indicated that a 400 cubic feet per second (cfs) minimum flow would enhance aquatic resources downstream of Lloyd

Shoals Dam. The GADNR and the Service recommended, and FERC approved, minimum flow releases of 400 cfs, or inflow, from the Lloyd Shoals Dam. The minimum flow releases were adopted to support fish population and aquatic community attributes suggesting a good to excellent fishery resource (FERC 1993).

The historic effects of erosion and sedimentation in the Project Site are not perceived as significant threats to the robust redhorse or its habitat in the Project Site. The threats to robust redhorse habitat from sedimentation have been reduced in recent years by extensive reforestation in the watershed. In addition, water quality has been improved through the construction of the aeration weir and increased minimum flows below Lloyd Shoals Dam. Therefore, the Parties believe reintroduction of robust redhorse within the Project Site will not be adversely affected by water quality problems.

3. Fishery

The habitat in the Project Site consists of typical Piedmont riverine characteristics, such as gravel bars, shoals and sandy runs. The Ocmulgee River currently supports a healthy and diverse fish community that includes at least two species of riverine sucker, silver redhorse, *Moxostoma anisurum*, and "brassy jumprock", *Scartomyzon sp. cf. lachneri*. These species share habitats with the robust redhorse at other sites.

4. Watershed

The U. S. Forest Service's Oconee National Forest controls a significant portion of the watershed draining directly into the Project Site, and this area is well vegetated. Although water quality within the Project Site is relatively good, several tributaries of the Project Site (e.g., Herds Creek, Lee Creek, and Wise Creek) have been designated as partially supporting their designated uses. Erosion and sedimentation have impacted small stream habitats in these tributaries as indicated by fish surveys conducted by the GADNR, and GADNR is evaluating water quality impacts in these creeks. These tributaries are not expected to have a significant influence on the success of the Agreement. Work by the GADNR and other entities in these drainages is of interest to this Agreement but outside of its scope.

5. Withdrawals

The Flovilla, Jackson, and Jenkinsburg Water and Sewer Authority is permitted to withdraw 3.5 million gallons per day (mgd) below Lloyd Shoals Dam (Georgia Power 1991). These withdrawals are not thought to have significant impacts on the Project Site, because they are not located where they may affect riverine suckers, including the robust redhorse.

In summary, the Project Site was chosen because it is a large Piedmont and upper Coastal Plain river physiographically similar to other river reaches where robust redhorse have been located. The Project Site also has acceptable water quality and quantity, suitable gravel bars for spawning, plentiful food supply, low densities of non-native predators, and is known to support a diverse and healthy fish community.

X. CONSERVATION ACTIONS

In order to accomplish the objectives of this Agreement, the Parties agree to undertake the conservation actions described below. These actions are in addition to activities described in the Robust Redhorse Conservation Strategy, including research on habitat and life history requirements, recruitment, population genetics, development of culture techniques, and surveys for additional native populations. The Conservation Actions described below are consistent with the Parties' goal of establishing a new robust redhorse population within its historic range. The anticipated new population of robust redhorse will increase the number of wild individuals, provide information on the life history and biology of the species, and serve as a refugial population should one or more of the known wild populations be lost due to a catastrophic event. The following conservation actions are specific to the Project Site, and the responsible Party is identified for each action. Where responsibility for a specific action has not been designated or assigned, the Parties agree to implement such measures through additional agreement, as appropriate, or through modification of this Agreement.

1. Stock the Project Site

The GADNR will stock the Project Site with approximately 4,000 hatchery-reared robust redhorse fingerlings each year for five years. Once this Agreement becomes effective, the first stocking will occur during the following fall or spring season when water temperatures permit. The long-term goal of this action is to establish a refugial population from Oconee River parental stock that consists of a minimum of five year-classes. The Parties recognize, however, that variations from this goal may occur due to unforeseen circumstances and natural events and that these actions may require adaptive management changes, such as extending the stocking duration. For instance, monitoring and research may later indicate that stocked robust redhorse permanently leave the Project Site or that the Project Site is unsuitable for establishing a refugial or reproducing population.

GADNR is responsible for producing, tagging, and stocking the fish for this project. For the purposes of this Agreement, the hatcheries that will provide robust redhorse fingerlings will be determined each spring by the GADNR in coordination with the other Parties as each hatchery prioritizes pond space for rearing other fish species.

The Service will continue to provide a fish culturist and other in-kind services such as transporting eggs to hatcheries, as needed, to assist in the Oconee River spawning

activities. The Service, in association with its on-going work on the robust redhorse, has developed protocols that will be used in the production of fingerlings from eggs collected from Oconee River robust redhorse. Production of fingerlings typically consists of broodfish collection and spawning, incubation, and hatching of eggs; rearing of larval fish to fingerling size; collection and tagging of juvenile fish for stocking; and transport and release of fish in the Project Site. The number of fingerlings needed for this action represents 10% of typical annual production from the Oconee River.

2. Study the movement of introduced juvenile robust redhorse

Georgia Power will fund two surveys, one in year 1 and one in year 3, on the movement of introduced juvenile robust redhorse. Radio transmitters will be attached to a subset of the stocked fish and their movements monitored. Georgia Power will provide funding not to exceed $75,000 per survey (see Table 1). The research will be conducted by the USGS Research Unit at the University of Georgia. If the USGS Research Unit is unable to continue this work, Georgia Power will select another qualified contractor with approval of the Parties; such approval shall not be unreasonably withheld. The results of surveys will be provided to the other Parties in accordance with Section XI, Monitoring and Reporting.

3. Monitor abundance and distribution of introduced robust redhorse

Georgia Power will conduct or fund six surveys in order to monitor abundance and distribution of juvenile and adult robust redhorse within Project Site. These surveys will be conducted in alternate years, under clear, low-water conditions, and until an adult population of at least five year-classes is established, or until the monitoring or research indicate that the stocked robust redhorse largely moved out of the Project Site or that the Project Site is determined unsuitable for establishing a refugial population. Georgia Power will provide funding not to exceed $20,000 per survey for the Agreement duration to fund these actions (Table 1). The results of surveys will be provided to the other Parties in accordance with Section XI, Monitoring and Reporting.

4. Estimate population size

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. The population estimate will be conducted by the USGS Research Unit at the University of Georgia. If the USGS Research Unit is unable to continue this work, Georgia Power will select another qualified contractor with approval of the Parties; such approval shall not be unreasonably withheld. Georgia Power will provide funding necessary to complete these surveys, not to exceed $50,000 per survey (see Table 1). The

results of surveys will be provided to the other Parties in accordance with Section XI, Monitoring and Reporting.

XI. MONITORING AND REPORTING

The Parties will use the following guidelines in evaluating and adjusting the Conservation Actions as described in the Adaptive Management section. Overlap in the timetable is due to uncertainties with forecasting possible success. Georgia Power will prepare an annual Progress Report that will identify progress in implementing Conservation Actions. The report will be provided to the Service and the GADNR by December 31 of each year. Following the distribution of the annual Progress Report, the Parties will discuss the results and coordinate the next year's activities under this Agreement.

1. Establishment of a juvenile refugial population - Years 2 through 6

   To fulfill Conservation Action 2, Georgia Power will identify the location and presence of reintroduced juvenile robust redhorse through the telemetry studies identified above. In addition, Georgia Power will conduct or fund electrofishing sampling efforts, that will include a minimum of two to four days in alternate years as described in Conservation Action 3, to identify the habitat and locations used by juvenile or young adult robust redhorse. Success will consist of capture of individuals from three year-classes by year 6. Migration downstream will be evaluated through the telemetry studies, and appropriate changes to conservation actions may be proposed under the adaptive management provisions by the Parties to this Agreement.

2. Establishment of an adult refugial population - Years 6 through 11.

   After year 6, Georgia Power, with the assistance of the GADNR and the Service, will identify the location and presence of adult robust redhorse in the Project Site as described in Conservation Action 3. Sampling will include a minimum of two to four days conducted with water temperatures ranging from 20° Celsius to 25° Celsius. Success will consist of the collection of 3 or more adults of each sex from at least three year-classes. The Parties determined this success rate after considering that robust redhorse adults are difficult to collect with conventional electrofishing gear, even under ideal river conditions. The Project Site is considerably more difficult to sample than the Oconee River, with some sections inaccessible to electrofishing boats, and the ability to collect 3 adults of each sex within two to four days is comparable to catch rates in other rivers where populations of adult robust redhorse exist.

2. Establishment of a self sustaining population - Years 10 through 15.

   Georgia Power will identify the location and presence of spawning adults as described in Conservation Action 3. Sampling will include a minimum of two to four days conducted

in the spring with water temperatures ranging from 20 ° Celsius to 25° Celsius. Success will consist of collection of non-tagged juveniles and/or adults, which would indicate naturally-reproduced individuals (i.e., successful reproduction). Additionally, population estimates will be made using mark-recapture methods as indicated in Conservation Action 4. The carrying capacity and target population number for the Project Site are unknown at this time.

XII. FUNDING CONSERVATION ACTIONS

Funding, both in the form of monetary and in-kind services, for the Conservation Actions will be provided by Georgia Power, as set forth in the Conservation Actions section and summarized in Table 1. Additional resources may be applied to this project from other sources, but these are outside the scope of this Agreement. The Service has provided technical assistance in the Agreement and permit application development and in providing in-kind services described herein. The GADNR will also provide in-kind services as described herein.

Implementation of this Agreement is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any funds from the U.S. Treasury. The Parties acknowledge that the Service will not be required under this Agreement to expend any federal agency's appropriated funds unless and until an authorized agency official affirmatively acts to commit such expenditures as evidenced in writing.

XIII. ADAPTIVE MANAGEMENT

The Parties agree that adaptive management provisions are necessary to ensure that the Parties can take advantage of changing conditions or new information affecting the conservation of the robust redhorse and the ultimate success of this Agreement. Adaptive management provisions are especially necessary when, as here, certain biological information is being developed, specifically information on the habitat occupied by juvenile robust redhorse.

Georgia Power will evaluate annually the effectiveness of the Conservation Actions in a report to the GADNR and the Service as described in Section XI, Monitoring and Reporting, and recommend any necessary changes. The Parties may initiate requests to modify the Conservation Actions as provided for in the Duration section of this Agreement. Requests to modify this Agreement will be initiated through written notification to all Parties and will remain within the scope of this Agreement. Specific areas where adaptive management may occur include adjustments to stocking rates, survey frequency, sampling techniques, duration of stocking, and monitoring period. Appendix II contains some potential examples of circumstances where adaptive management may be appropriate.

XIV. NOTIFICATIONS

In the event that any of the Parties detect conditions that may adversely affect robust redhorse in the Project Site, such conditions will be reported to Georgia Power, the GADNR, and the Service. Such conditions may include, but are not limited to, evidence of fish kills, spills or releases of material that may affect that reach of the Ocmulgee River covered by the Agreement, increase in flathead catfish density, or significantly increased sedimentation within the Project Site.

Georgia Power agrees to provide the Service with an opportunity to rescue robust redhorse individuals before any authorized take occurs as described in the Enhancement of Survival Permit. Such notification that authorized take will occur must be provided to the Service at least 30 days in advance of implementing the action and will include a description of the action to be taken and measures to reduce the authorized take. Rescue actions undertaken by the Service shall not unreasonably interfere with the implementation of Conservation Actions under this Agreement.

By signature of this Agreement, Georgia Power agrees to notify the Service if ownership of the covered property is to be transferred to another owner and to provide such notice 30 days in advance of the transfer. If Georgia Power transfers ownership of the enrolled property, the Service will regard the new property owner as having the same rights and obligations as Georgia Power if the new property owner agrees to become a Party to the Agreement. Actions taken by the new participating property owner that result in the take of the robust redhorse would be authorized if the new property owner maintains the terms and conditions of the Agreement. If the new property owner does not become a Party to the Agreement, the new owner would neither incur responsibilities under the Agreement nor receive the ESA regulatory assurances that accompany the Agreement and Permit.

After any notification of change in ownership, the Service will contact the new or prospective owner to explain the existing Agreement and to determine whether the new property owner would like to continue the original Agreement or enter a new Agreement. When a new property owner continues an existing Agreement, the Service will honor the terms and conditions of the existing Agreement.

XV. LANDOWNER ASSURANCES

Through this Agreement, the Service provides Georgia Power assurances that if the robust redhorse is listed under the ESA and the Agreement has been implemented in good faith by Georgia Power, the Service will not require additional conservation measures nor impose additional land, water, or resource use restrictions beyond those Georgia Power voluntarily committed to under the terms of the original Agreement. Georgia Power requested and is hereby granted the following additional assurance that is specific to its needs:

The Service will not impose or require Georgia Power to alter its operation of Lloyd Shoals Dam for the benefit of the robust redhorse for the duration of this Agreement, including alteration of the flow regime specified in the FERC license.

These assurances will be authorized through issuance of an enhancement of survival permit under section 10(a)(1)(A) of the ESA, which will authorize incidental take of robust redhorse consistent with the terms of the Agreement. The Permit is incorporated as Appendix III of this Agreement and will become effective on the date that the robust redhorse is listed as threatened or endangered or in some other manner becomes subject to the ESA in the future. At that date, Georgia Power will be authorized take of robust redhorse in conjunction with implementation of the Conservation Actions specified in the Agreement. The take is expected to be in the form of mortality, harm, and harassment associated with reintroducing, surveying, and monitoring released individuals and their offspring. The Service has determined that this level of take will not jeopardize the species' continued existence.

The Permit will not be revoked for any reason except those set forth in 50 CFR 13.28(a)(1-4) or unless continuation of the permitted activity would be inconsistent with the criterion set forth in 50 CFR 17.22(d)(2)(iii) and the inconsistency has not been remedied in a timely fashion.

The assurances provided apply only to the robust redhorse inasmuch as the Agreement is being properly implemented. The assurances provided shall in no way limit the Service's retention of its obligations and authorities for consultation under section 7(a)(2) of the Endangered Species Act relative to future FERC relicensing activities at Lloyd Shoals Dam or other Federal actions that may occur within the Project Site that may affect the robust redhorse or other listed, proposed, or candidate species.

The Parties agree and understand that entering into this Agreement does not preclude or otherwise remove the Service's authority to list the robust redhorse as a threatened or endangered species under the ESA should the Service determine that listing the robust redhorse is necessary pursuant to section 4 of the ESA.

XVI. UNFORESEEN CIRCUMSTANCES

1. Changed circumstance provided for in this Agreement.

   If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and were provided for in the Agreement, Georgia Power will implement the measures specified in the Agreement.

2. Changed circumstances not provided for in the Agreement.

   If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and such measures were not provided for in the Agreement, the

Service will not require any conservation and mitigation measures in addition to those provided for in the Agreement without the consent of Georgia Power, provided the Agreement is being properly implemented.

3. Unforeseen circumstances.

(A) In negotiating unforeseen circumstances, the Service will not require the commitment of additional land, water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the robust redhorse (*Moxostoma robustum*) without consent of Georgia Power.

(B) If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the Service may require additional measures of Georgia Power where the Agreement is being properly implemented, but only if such measures are limited to modifications within the Project Site, if any, or to the Agreement's Conservation Actions for the robust redhorse, and maintain the original terms of the Agreement to the maximum extent possible. Additional conservation and mitigation measures will not involve the commitment of additional land, water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the Agreement without the consent of Georgia Power.

(C) The Service will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the robust redhorse. The Service will consider, but not be limited to, the following factors:

(a) Size of the current range of the robust redhorse;
(b) Percentage of range adversely affected by the Agreement;
(c) Percentage of range covered by the Agreement;
(d) Ecological significance of that portion of the range affected by the Agreement;
(e) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the Agreement; and
(f) Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

XVII. DURATION

The term of this Agreement will be for a period of 22 years consistent with the term of the existing FERC license for the Lloyd Shoals Dam (FERC No. 2336) which will expire in 2023. The Parties believe that this is the minimum time necessary to establish a reproducing adult

population of robust redhorse containing multiple year classes and for stability in the population numbers to be achieved and assessed by the Parties.

1. Continuation

If the goals of the Agreement are met or if the Parties agree that sufficient progress is being made toward the conservation of the robust redhorse, this Agreement may be continued without modification for another term to which the Parties must all agree.

2. Amendments

Amendments to this Agreement can be proposed by any Party to the Agreement and must be provided to the other Parties in writing. All Parties will have at least 60 days to evaluate proposed amendments, and all amendments must be approved in writing by each Party. Amendment of this agreement requires the consent of all Parties. The Agreement may be amended to include, or separate Memoranda of Understanding and/or Cooperative Agreements may be developed with, additional Parties as necessary to ensure implementation of specific conservation measures contained in this Agreement.

3. Termination

(A) Georgia Power may terminate this Agreement prior to the expiration date, with good cause, even if the terms and conditions of the Agreement have not been realized. However, the Permit would also be terminated at the same time. Georgia Power will submit a letter to the Parties providing 60 days notice of its desire to terminate the Agreement. Georgia Power will remain responsible for any outstanding conservation actions identified in the Conservation Actions section of the Agreement for which it is responsible until the early termination date. Conditions required by the Permit and the assurances provided by the Permit will remain in effect until the early termination date.

(B) The GADNR may withdraw from this Agreement at any time by submitting a letter providing 60 days notice indicating its desire to withdraw from the Agreement. The GADNR will remain responsible for any outstanding conservation actions identified in the Conservation Actions section for which it is responsible until the termination date.

(C) Nothing in this Agreement shall restrain or limit any Party from taking additional conservation actions not described in this Agreement, at it's own expense, to protect or conserve the robust redhorse, provided that such measures are consistent with the conservation goals of the Agreement.

XVIII. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

Survey, collection, or research activities associated with implementation and maintenance of this Agreement will not constitute a significant Federal action as defined in NEPA and are given a categorical exclusion designation under 516 DM 2, Appendix 1.10.

XIX. FEDERAL AGENCY COMPLIANCE

During the performance of this Agreement, the Parties agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, age or national origin. No member or delegate to Congress or resident Commissioner shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

XX. SIGNATURES

Christopher M. Hobson
Vice President, Environmental Affairs
Georgia Power Company

David Waller
Director
Georgia Department of Natural Resources,
Wildlife Resources Division

Sam Hamilton
Regional Director
U. S. Fish and Wildlife Service

XXI. LITERATURE CITED

Evans, J. personal communication (see page 6)

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Jennings, C., B. J. Heff, and J. Hilterman, 2000. Population dynamics of robust redhorse (*Moxostoma robustum*) in the Oconee River, Georgia. Completed for the USGS Biological Resources Division. University of Georgia Research Work Order 52.

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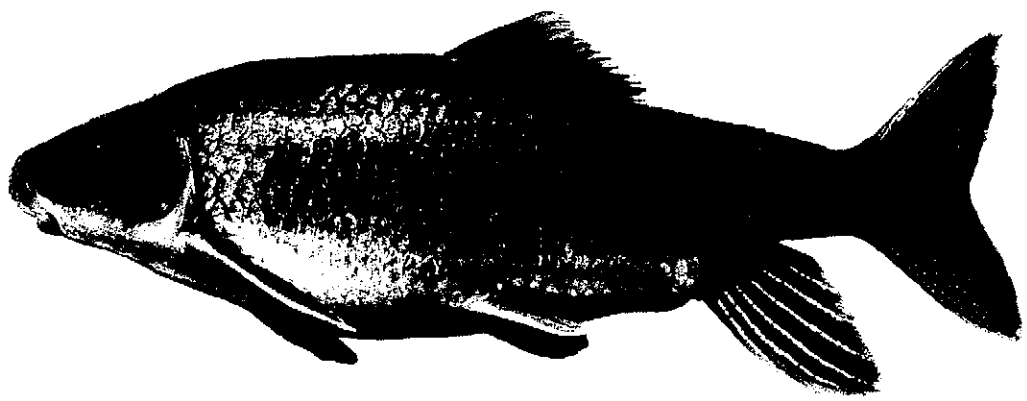
APPENDIX I

Robust Redhorse Conservation Strategy

Robust Redhorse
Conservation Strategy



Robust Redhorse (*Moxostoma robustum*) Dr. B. J. Freeman, Institute of Ecology, University of Georgia

Georgia Department of Natural Resources

South Carolina Department of Natural Resources

North Carolina Wildlife Commission

Georgia Power Company

Duke Power Company

Carolina Power and Light

South Carolina Aquarium

South Carolina Electric and Gas

Georgia Wildlife Federation

U. S. Fish and Wildlife Service

U. S. Geological Survey Biological Resources Division

U. S. Forest Service

U. S. Army Corps of Engineers

Georgia River Network

Conservation Strategy
For
Robust Redhorse (*Moxostoma robustum*)

Prepared by
Mike Nichols
Environmental Laboratory
Georgia Power Company

For

Robust Redhorse Conservation Committee
February 25, 2003

Approvals:

Greg Looney, Chairman Robust Redhorse Conservation Committee

Date: May 6, 2003

Robust Redhorse Conservation Strategy

I. INTRODUCTION

The robust redhorse (*Moxostoma robustum*) was described by Edward Cope in 1870 from specimens collected in the Yadkin River, North Carolina. The species was essentially lost to science until 1991 when five specimens were collected by Georgia Department of Natural Resources, Wildlife Resource Division (WRD) biologists downstream of Sinclair Dam on the Oconee River near Tombsboro, Georgia. As of 2002, wild individuals are known to exist in the Oconee and Ocmulgee rivers in Georgia, the Savannah River of Georgia and South Carolina and the Pee Dee River of North and South Carolina. The species is considered to be very rare and is classified as endangered by the Georgia Department of Natural Resources (Freeman, 1999). Recovery efforts have been initiated by a diverse group of stakeholders that comprise the Robust Redhorse Conservation Committee (RRCC). The RRCC was established in 1995 through a Memorandum of Understanding ("MOU") among stakeholders including state and federal agencies, conservation organizations, and the private sector. The MOU establishes a mechanism for conducting research on the robust redhorse, coordinating conservation actions, and sharing information on its status. The primary goals of the RRCC are to develop an understanding of the biology and status of this species, and to reestablish reproducing populations within its historic range. Current members of the RRCC include U. S. Fish and Wildlife Service, Georgia Department of Natural Resources, South Carolina Department of Natural Resources, U. S. Army Corps of Engineers, Georgia Power Company, Duke Power Company, CP&L—A Progress Energy Company, South Carolina Electric and Gas Company, U. S. Geological Survey Biological Resources Division, North Carolina Wildlife Resources Commission, U. S. Forest Service, Georgia Wildlife Federation, Georgia River Network, and the South Carolina Aquarium.

The Parties to this Robust Redhorse Conservation Strategy ("the Strategy") intend the Strategy will promote voluntary conservation initiatives and stakeholder partnerships for conserving the robust redhorse as a logical outgrowth of conservation efforts taken by the Parties since 1991. The Parties view the Strategy as a guide for decision making, allocation of resources, and a summary of research objectives. As such, this Strategy is intended to be consistent with, and in the spirit of, the Endangered Species Act. The Endangered Species Act contains provisions designed to encourage creative partnerships between public and private sectors and among government agencies to conserve imperiled species and their habitat (Endangered Species Act, 2(a)(5)). An example of this type of provision is the Candidate Conservation Agreement with Assurances (Conservation Agreement) as described in 64 Federal Register 32706 (1999).

Participation in the RRCC and decision making is described in policies developed by the RRCC. These policies where adopted by consensus during the RRCC annual meeting held October 16-18, 2002 (RRCC, 2002) and are the means for implementing the Strategy.

II. PURPOSE

The purpose of this Conservation Strategy is to assure the continued survival of the robust redhorse within its historic range. This document describes the status and distribution of the species, discusses problems facing the species, and presents conservation actions to be implemented.

III. STATUS AND DISTRIBUTION

A. Systematics and taxonomy

Five large catostomids were collected by Georgia Department Natural Resources biologists from the Oconee River, Georgia, near the mouth of Commissioner Creek on August 8, 1991. Meristic characteristics did not correspond precisely to any known species and average length exceeded all catostomid species known to occur in the Altamaha River drainage. Dr. Bud Freeman, curator of the Georgia Museum of Natural History Fish Collection, and Dr. Henry Bart, then curator of the Auburn University fish collections, independently indicated the fish might belong to what was then believed to be an undescribed species known to ichthyologists by only two existing specimens: one collected from the Savannah River, Georgia-South Carolina in 1980; and a second from the Pee Dee River, North Carolina, in 1985. Dr. Bob Jenkins, Professor of Biology at Roanoke College, determined that the specimens matched the description of a large North American sucker first described by Edward Cope in 1870.

The catostomid in question is now believed to have been described by Edward Cope in 1870 based entirely on a large stout specimen collected in 1869 from the Yadkin River (Pee Dee drainage), North Carolina and given the scientific name *Ptychostomus robustus (Ptychostomus* is synonymous with the present genus *Moxostoma*). Cope's original type specimen was lost long ago and later workers erroneously labeled much smaller specimens of another species as types. Hence the scientific name *P. robustus* was misapplied by later revisers of the Catostomidae to a smaller species. This smaller species, sympatric with the larger more robust form, has since 1956 been known in the scientific literature, incorrectly, as *Moxostoma robustum* – the smallfin redhorse. As a result of these investigations, the scientific name *Ptychostomus (Moxostoma) robustus* will be transferred as *Moxostoma robustum* (Cope) (robust redhorse) to the species known from the Oconee, Pee Dee, and Savannah River specimens (Jenkins and Freeman, and Evans in preparation; Jenkins, in preparation).

The robust redhorse is a long-lived, large, heavy-bodied sucker that attains total lengths greater than 700 mm and weights up to 8 kg. The oldest specimen that has been aged is believed to have been 27 years old. This species has large molariform pharyngeal teeth specialized for crushing hard-bodied prey such as mussels, and is the only species within its range with this character. The robust redhorse is bronze on the back and sides becoming pale or white ventrally. Adults are faintly striped along lower sides. Juveniles will have intense red in the caudal fin and anal fins, which becomes less distinct in adults.

Adult males develop large tubercles on the snout and head during the spawning season. The robust redhorse is distinguished from other Atlantic Slope suckers by coloration, large head, large adult size, and the straight margin of the lower lip often with the medial plicae extending more posterial than marginal plicae (i.e., a pronounced "flap" on the lower lip in adults). Members of the genus *Moxostoma* differ from the genus *Scartomyzon* by having 12-13 caudal peduncle scale rows rather than 15 or 16 .

B. Status, distribution, and habitat requirements

1. Existing Conditions

The robust redhorse is presently found in piedmont and upper coastal plain sections of the Oconee and Ocmulgee rivers, Georgia, the Savannah River, Georgia / South Carolina, and the Pee Dee River, South Carolina/North Carolina. The RRCC considers the extant populations to be Evolutionary Significant Units (ESUs) based on current genetic information. The RRCC will continue to manage identified ESUs as distinct populations in order to maintain the genetic diversity of the species across its historic range (See RRCC, 2002}.

Introductions have occurred in the Broad River and a population is now believed to exist in this river and the downstream reservoir, Clarks Hill Reservoir, Georgia. Introductions are also occurring in the Ogeechee River, and in a segment of the Ocmulgee River, Georgia.

The recent discovery of robust redhorse in the Savannah, the lower Ocmulgee, and Pee Dee rivers, which have been extensively sampled for other species, suggests that this species can be difficult to collect, or may have been overlooked or improperly identified in the past.

2. Distribution

The historic range of the robust redhorse is believed to include Atlantic Slope drainages from the Pee Dee River in North Carolina to the Altamaha River in Georgia. Individuals have been recorded from natural populations in the Pee Dee River, North Carolina, the Savannah River, Georgia / South Carolina, and the Oconee and Ocmulgee rivers, Georgia since 1991

A population of unknown size exists in the Pee Dee River, North Carolina/South Carolina, in the lower segment of the Yadkin-Pee Dee River system which this species historically occupied. Three specimens from the Pee Dee River have been collected in a 28-mile reach of the river in the piedmont/coastal plain regions of North Carolina/South Carolina below Blewett Falls Dam during 2000-2001.

Six native fish were captured from the Savannah River between October 1997 and October 1998. One was captured downstream from the New Savannah Bluff Lock and Dam in October 1997. Four fish were captured from the Augusta Shoals area in June

1998 and an additional fish was captured near the US 301 bridge in October 1998. Subsequently, twenty-three adults in spawning condition were collected in May 1999 from the Savannah River in the Augusta shoals area and four from below the New Savannah Bluff Lock and Dam. The size of the Savannah River population is uncertain at this time and is being investigated.

The Oconee River population is known from a 70 mile reach between Milledgeville and Dublin, Georgia (Evans, 1994). The population estimate was re-evaluated during 1999 and is believed to consist of 600 adult fish in the reach between Dublin, Georgia, and Big Black Creek (Jennings et al., 2000). An unknown but probably smaller number exist between Big Black Creek and Milledgeville.

The RRCC reintroduced the robust redhorse into the Broad River (located in the Savannah River drainage) and the Ogeechee River in Georgia. Approximately 32,000 age 0 and age 1 fingerlings from multiple year classes have been introduced into the upper Broad River, Georgia, between 1995 and 1998. Forty-five of these fish, ranging in length from 30 to 40 cm, have been recovered 60 miles downstream in Clark Hill Reservoir (C. Jennings, personal communication).

Reintroductions are also occurring in the Ogeechee River, and a segment of the Ocmulgee River, Georgia.

3. Life history

Most of the information available concerning the life history of this species has been generated from research conducted on the Oconee River. The robust redhorse spawns during April, May, and June when water temperatures reach 21 to 23 degrees Centigrade, although spawning may occur over the range from 18 to 25 degrees Centigrade. Spawning is typical of *Moxostoma* and involves spawning triads with two males fertilizing the eggs of a single female, which are deposited in gravel substrate. Shallow water conditions in the Oconee River occasionally allow visual observation of spawning fish, but there are indications of spawning activity at greater depths as well (Freeman et al., 1998). Adult fish are large (modal total length 66 cm, range from 42 cm to 72 cm). Juveniles less than 40 cm in length have not been collected from the Oconee River.

The requirements for successful recruitment of robust redhorse are not fully understood. The requirements for successful emergence of yolk-sac larvae from gravel beds include absence of fine sediment (Dilts, 1998). The subsequent food requirements and preferred habitats of juvenile robust redhorse are poorly understood. The recruitment rates in the Oconee River appear to be low, but need to be examined in the context of the population size and the long life span of the robust redhorse. Recruitment and population dynamics in the Ocmulgee, Savannah, and Yadkin-Pee Dee populations are not presently well documented. Possible migration of juveniles and adults are also not well understood. These are priority subjects of current research.

Diet studies of adults are limited. The few specimens examined from the Oconee River

suggest that adult fish feed primarily on bivalves, including the Asiatic clam (*Corbicula* sp.). The life span of robust redhorse is believed to be 25 to 30 years and the major known population is believed to be composed of numerous year classes (Jenkins, unpublished data).

4. Habitat requirements

The robust redhorse inhabits Piedmont Plateau and upper Coastal Plain sections of South Atlantic slope rivers. Piedmont reaches are characterized by rock shoals, outcrops, and pools, particularly along the Fall Line. The upper Coastal Plain reaches typically have sandy banks and beds interspersed with shoals and gravel bars. The upper Coastal Plain reaches also have extensive networks of swamps, oxbows, and floodplains. Woody debris and fallen trees seem to provide preferred habitat for adult robust redhorse in the Oconee River. Clean gravel bars are necessary for spawning and development of larval fish.

5. Site specific habitat and biological information

Site specific information should be evaluated when reintroduction is planned(See RRCC, 2002) Site characteristics recommended for consideration include:

Habitat
- Suitable flow
- Spawning areas consisting of suitable gravel substrate
- Adequate food supply
- Accessibility for sampling and monitoring
- Available river miles for sustaining a refugial or reproducing population
- Presence of woody debris providing cover for adults

Fishery issues
- Predatory fish presence and densities
- Genetic composition of stocked fish and isolation from other populations
- Impacts on native species (other endangered species)
- Impacts on commercial and sport fisheries
- Presence of historic fishery data, including surveys for robust redhorse
- Biomass or abundance of non-native species

Watershed criteria
- Presence of hydropower operations and low-head dams
- Significant water withdrawals
- Current water quality issues summarized in 305(B) reports
- Historic water quality data
- Non-point source management plans and practices
- NPDES permitted discharges which may influence water quality
- Active river or watershed protection group capable of monitoring and influencing land use
- Land use patterns (urban, forested, agriculture, feed lots)

- Presence/absence of sand and gravel operations

C. Research status and needs

1. Initial studies

Research regarding the status and re-establishment of robust redhorse populations has been underway since 1992. The Robust Redhorse Conservation Committee has coordinated research and management of the robust redhorse since 1995. Early research focused primarily on the Oconee River population, with emphasis on the following areas:

- flow requirements for young of year fish;
- larval fish densities;
- recruitment rates for the existing population;
- gravel substrate requirements for successful spawning;
- the process for collecting adult brood fish, collecting and fertilizing eggs, and rearing juvenile fish for reintroduction; and
- surveys for additional populations within the historic range.

The process for propagating fish has been established, although difficulty continues to be experienced with survival rates from the post yolk sac larval stage to harvestable juveniles after one or two years. This may be related to nutritional or habitat requirements during this stage. The rate of survival of year 1 fingerlings from eggs of artificially spawned robust redhorse has increased from 11 per cent in 1995 to 67 percent in 1997. The production of year 2 fingerlings from ponds, however, has been variable. The low production rate in 1996 (7.7% from fry to year 2 harvest) has resulted in an emphasis on using year 1 fingerlings for introductions. There is speculation that the survival of larval fish past the yolk sack stage in the hatchery environment is affected by nutritional requirements and food availability (Shelton, 1998). The propagation of robust redhorse is described in RRCC policies (See RRCC, 2002)

Larval fish (13 to 20 mm in length) are capable of swimming speeds in the range from 7 to 12 cm per second and exhibited avoidance behavior of high flow rates in laboratory systems (Ruetz and Jennings, 1997). The flow velocities in the Oconee River from hydroelectric and natural events are not believed to significantly restrict young of year habitat because habitable areas exist with flow velocities less than 7 cm per second even during varying flow conditions (Ruetz and Jennings, 1997). Beginning in 1997, the operation of Sinclair Dam on the Oconee River, Georgia, provides run of river flows from May 1 through June 10, removing potential negative effects of hydro-peaking during the spawning and early rearing period. The Flow Advisory Team, a subcommittee of the RRCC, is responsible for evaluating the effect of the flow regime on robust redhorse. Research indicates that emergence (swim-up) success is reduced in gravel substrate with significant percentages of fine sediments. Fifteen percent fine sediment to gravel ratio resulted in fifty percent survival measured as the emergence rate of fry. It is projected

from laboratory data that successful larval emergence rate in the Oconee River is approximately eight percent (Dilts 1998).

Larval fish densities have been assessed since 1995 as part of an on-going task to estimate the reproductive and recruitment success of robust redhorse in the Oconee River (Jennings et al, 1996). Multiple gear types including push-nets, D-ring nets, light traps, and seines have been used to sample larval and post-larval fish. Estimated densities at specific sampling locations are based on low sample numbers of robust redhorse and are variable. Prior to implementing the license flow agreement for Sinclair Dam in 1997, densities ranged from 0 to 13.4 larvae per 1000 cubic meters during May 1995 and 0 to 3.4 larvae per 1000 cubic meters during May and early June, 1996. Subsequent to implementing run-of-river flows in the spring, densities ranged from ? to 33 larvae per 1000 cubic meters during May 1997, and from ? to 10 larvae per 100 cubic meters during May 1998. (Do not have numbers for 1999). The low number of individuals collected and the variation in the natural hydrology of the Oconee River have made interpretation of results difficult, but the collection of greater numbers of other larval and post-larval catostomids suggests that the recruitment rates are unusually low.

The population number in the Oconee River was re-evaluated in 1999-2000 in order to assess its current status (Jennings et al, 2000). This study evaluated the capture data collected from 1994 through 1999 and implemented a capture-recapture study to provide parameters for use in the Jolly-Seber population model. The population is estimated to consist of 607 (standard error = 138) robust redhorse greater than 417 mm total length in the Oconee River between Dublin and a point one river mile above Black Creek. This assessment indicated that new individuals were recruited to the population annually (ranging from 5 to 57% of the estimated population in each of four years evaluated). Survival of robust redhorse from year to year was high (average of 0.68) but variable.

2. Current research

Current research is focused on robust redhorse culture, genetics, and biological requirements. Research projects include:

- Locating and characterizing spawning sites;
- Evaluating collection methods for juvenile fish, and locating preferred habitat(s);
- Evaluating the genetic variability of existing populations; and
- Assessing abundance, mortality rate, and recruitment rate for the known populations.
- Study of movement of wild adults and cultured juveniles
- Evaluating population status in river systems in the historic range; and
- Evaluation of mass marking of fry and fingerlings

IV. PROBLEMS FACING THE SPECIES

Species warrant listing under the Endangered Species Act if the species is endangered or threatened throughout all or a significant portion of its range due to any one of the following five listing criteria:

- present or threatened destruction, modification, or curtailment of its habitat or range;
- overutilization for commercial, recreational, scientific, or educational purposes;
- disease or predation;
- inadequacy of existing regulatory mechanisms; or
- other natural or manmade factors affecting its continued existence.

A. Habitat

Current research indicates that habitat modification is one of the primary factors affecting the decline of robust redhorse. Historic land use practices including intensive farming and deforestation led to excessive erosion and subsequent sedimentation, and caused dramatic changes in riverine habitats. Reproduction by this species appears to be sensitive to sedimentation (Dilts, 1998). Mollusks, presumed to be a major food source for the robust redhorse, would also have been severely impacted by sedimentation (Stansbery, 1971) (although Asiatic clams, a food source, have proliferated). Although direct cause and effect relationships have not been determined, water quality degradation from point and non-point sources may also have contributed to historic declines.

The members of the RRCC are pursuing habitat restoration opportunities within the affected watersheds, including habitat restoration, restoration of degraded stream channels, and the development of conservation agreements. Specific activities include development of a policy on habitat restoration addressing potential funding, partnerships, and activities (See RRCC, 2002). Water quality concerns are addressed primarily through the federal and state permitting process.

It is possible fisheries workers have missed the robust redhorse in collections and the current range of the species may be underestimated as a result. Because of the robust redhorse's benthic habitat and the depth of rivers, additional populations may exist within the historic range but remain undetected.

B. Over-utilization

Other factors affecting the decline of robust redhorse may include historic over-harvesting in the late 1800s during the spawning season when the fish are vulnerable. There appears to be no current over-utilization for commercial, recreational, or educational purposes.

C. Disease or predation

Robust redhorse from the Oconee River and Savannah River have been examined for the presence of parasites and infectious diseases by the US Fish and Wildlife Service's Warm

Springs Fish Health Center. No evidence of infectious disease has been identified in fluid or tissue samples collected from wild fish (Heil, 1997, 1998).

The introduction of non-native species such as the flathead catfish has influenced the abundance of native fish species (Evans, 1991), and may impact robust redhorse populations through predation on juveniles. Flathead predation on young robust redhorse is suspected to be a significant factor in limiting recruitment into the Oconee River or other river populations, however, the extent of any predation is unknown. Flathead catfish have been introduced in nearly all of the large southeastern rivers within the historic range of the robust redhorse. Effective control of the flathead catfish may not be possible, and it is unclear whether removal efforts would have a significant long-term impact on flathead catfish or robust redhorse populations. The flathead catfish is a potential concern for the RRCC conservation efforts. The effect of predation by flathead catfish on robust redhorse has not been evaluated due to practical limitations in conducting such studies. Additionally, the impact and interactions of other large, non-native fishes, such as smallmouth buffalo, blue catfish, and common carp with the various life stages of robust redhorse are also presently not well understood or defined in the river systems where these species coincide.

D. Inadequacy of existing regulatory mechanisms

Many of the environmental factors believed to have reduced populations of robust redhorse to the current levels are historic in nature, including sedimentation from poor land use practices, and chronic, (and severe) water quality degradation. The implementation of the Clean Water Act, the Resource Conservation and Recovery Act, the National Environmental Policy Act, agriculture and soil conservation programs, reforestation, and many other regulatory programs, have improved riverine conditions significantly.

Development of hydropower facilities affects robust redhorse populations by limiting access to probable historic spawning sites and reducing the amount of historic riverine habitat. Site specific flow regimes may be limiting factors below hydropower facilities but can be addressed through the FERC relicensing process for non-federal projects and by NEPA for actions involving federal projects. In many cases, dams also help with sedimentation loading in immediate downstream riverine areas by acting as sediment traps and thus locally improving water quality in tailwater reaches.

While the RRCC has no authority to manage non-point source pollution impacts, participants including the U. S. Fish and Wildlife Service and the state natural resource agencies are pursuing riparian enhancements, watershed protection plans, and similar habitat protection activities through the federal and state regulatory processes. The U. S. Fish and Wildlife Service and state agencies participating in the conservation effort conduct extensive reviews of proposed projects that may impact habitat for robust redhorse. These environmental reviews are major considerations in the issuance of state and federal permits.

E. Other natural or manmade factors affecting its continued existence

The limited geographic range and the presumed low number of wild individuals are considered the most serious threat facing the continued survival of the robust redhorse. The recent discovery of wild populations in the Ocmulgee, Savannah, Pee Dee rivers suggest further exploration of other rivers within the historic range or adjacent rivers close to the historic range (e.g. Cape Fear River) may be productive.

The existing Oconee River population appears to be genetically heterogeneous and actively spawns in the spring (RRCC, 1997). An age and growth investigation indicated over 90% of the population is between 15 and 26 years of age although a few fish as young as 5-6 years have been collected. The absence of juvenile fish from surveys in the Broad River following introduction of 32,000 fingerlings between 1995 and 1998 is consistent with this pattern. The collection of over 40 tagged fish from this introduction in Clarks Hill Reservoir during 1998 through 2002 is also consistent with the observation that collected fish typically have minimum lengths of 40 cm and that a sampling bias may occur.

Lasier et al. (2001) evaluated sediment associated contaminants in the lower Oconee River to determine their sources and evaluate potential for reducing survival and growth of early life stages of robust redhorse. Manganese and zinc were found to be present in potentially deleterious concentrations in sediment pore water, but only zinc was found to inhibit growth in the selected surrogate, a freshwater amphipod, Hyalella azteca. Significant reductions in sediment-metal concentrations occurred between the fall of 1998, when amphipods were tested, and the spring of 1999 when robust redhorse egg and larval stages were evaluated. While manganese concentrations for sediments collected in the spring of 1999 were lower than concentrations in sediments from the fall of 1998, pore water collected downstream of specific creeks discharging into the Oconee River did exhibit toxicity to early robust redhorse life stages. Toxicity is believed to be related to the concentration of manganese and reduction to the Mn^{2+} species.

V. CONSERVATION ACTIONS TO BE IMPLEMENTED

A. Conservation Goals

The following short and long-term goals have been adopted and are implemented though consensus policies approved by the RRCC in October, 2002 (See RRCC, 2002).

1. Short-term goals (2003 – 2008)

   a) Establish refugial populations to reduce the impact of potential catastrophic events on known populations and core ESUs.

   b) Locate wild populations within the historic range

   c) Determine characteristics of populations, including population size, age structure, genetic variability, recruitment rate, and mortality rate.

   d) Implement necessary actions to maintain populations.

   e) Identify and implement habitat restoration and/or protection measures to benefit the species.

2. Long term goals

   Establish or maintain at least six self-sustaining populations distributed throughout the historic range.

B. Conservation Actions

The conservation actions necessary to achieve long and short tem goals are included in specific policies adopted by the RRCC. Specific conservation actions are adopted in management plans for each river system or distinct ESU. These actions address the following:

1. Implement habitat restoration and watershed management practices to protect suitable spawning sites, nursery, and adult holding sites.

2. Assess possible existence of additional spawning sites.

3. Manage artificial propagation from adult broodfish collected from specific ESUs with an identified need for reintroduction of robust redhorse into selected river systems and refugial ponds.

4. Establish a list of candidate sites and a process for prioritization,

5. Determine habitat and life history requirements.

6. Establish river basin management plans or agreements to implement conservation actions for specific sites, including monitoring survival and growth.

The conservation actions necessary to achieve short and long term goals are described in specific policies adopted by the RRCC. These policies provide the operating principles for this conservation effort including: goals; restoration, biology, and conservation; and administration (RRCC, 2002).

C. Monitoring

Monitoring and reporting on the status of the robust redhorse is an important and necessary part of this Conservation Strategy (See RRCC, 2002). Interested organizations, as well as the public at large, are kept informed of the RRCC's efforts on behalf of the robust redhorse and the results of those efforts. In order to monitor the species properly, the RRCC has determined it necessary to take the following steps:

D. Organization and Resources

The continuing coordination issues of the overall effort are the responsibility of the RRCC Excom. The RRCC Excom review research needs, prioritizes projects for proposal and funding, and coordinate use of resources. The RRCC Excom includes representatives from research institutions, US Fish and Wildlife Services, state natural resource agencies, and other participants (See RRCC, 2002).

In addition, each river system is assigned a technical working group (TWG). TWGs represent the members of the RRCC who are actively engaged in research, protection, and restoration of robust redhorse in a specific geographic region. The Conservation Actions developed for the river basin / ESU management plan are coordinated by the TWG and implemented using facilities and resources provided by its members.

The following list examples of research funding and resources provided to this effort.

Georgia Power Company funds research regarding the habitat requirements and recruitment success of the Oconee River population.

The U. S. Fish and Wildlife Service and the Georgia Department of Natural Resources fund brood-fish collection, hatchery operation, reintroduction efforts, and status surveys.

The South Carolina Department of Natural Resources provides additional hatchery production, conducts surveys, and manages projects in South Carolina drainages.

The South Carolina Department of Natural Resources, the North Carolina Wildlife Resources Commission, the U.S. Fish & Wildlife Service, and CP&L conduct population status surveys on the Yadkin-Pee Dee River.

The Electric Power Research Institute funds population genetics research with financial support by Duke Power Company and CP&L.

Georgia Department of Natural Resources and Georgia Power Company fund research on improving culture techniques.

In addition to funding for conservation actions under this Conservation Strategy, specific actions may be agreed upon in Reintroduction Programs (see RRCC, 2002) or through specific Conservation Agreements. Funding for these activities is described in the respective management plans or agreements.

VI. CONSERVATION AGREEMENTS

The Endangered Species Act includes provisions for conservation agreements among private and non-Federal property owners, State and local managing agencies, and the US Fish and Wildlife Service to restore, enhance, or maintain habitats for proposed, candidate and other unlisted species. Conservation agreements may facilitate reintroduction of robust redhorse and related habitat protection through definition of certain goals and commitments by parties cooperating in this restoration effort. The following describes important aspects of these agreements.

A. Conservation Benefits

Implementation of Conservation Agreements for reintroduction of robust redhorse at a number of similar sites may be a necessary step to remove threats to the continued existence of this species as described in section III of this document. It is believed that clearly delineated responsibilities and actions will facilitate conservation of this species.

B. Non-Federal Landowner Assurances

Conservation Agreements may include assurances for property owners that if the robust redhorse is listed as a Federal Endangered Species at a future date, and the agreement has been implemented in good faith by the participating non-federal property owner, the US Fish and Wildlife Service will not require additional conservation measures nor impose additional land, water, or resource restrictions beyond those committed to under the terms of the original agreement. Assurances involving take will be authorized through the issuance of a section 10(a)(1)(A) Enhancement of Survival permit, which will allow the property owner to take individuals of the covered species consistent with those levels agreed upon and identified in the agreement.

C. Adaptive Management Provisions

Adaptive management provisions are necessary to ensure that unforeseen circumstances affecting the conservation of the robust redhorse can be adequately addressed through Conservation Agreements. Adaptive management provisions are especially necessary when, as here, significant biological information is lacking, including information on the life history of the species, possible existence of additional wild populations, and the effectiveness of proposed conservation measures described in specific Conservation Agreements.

If unforeseen circumstances arise through the development of new biological information or result from a catastrophic event that warrant additional conservation measures, such measures would, to the maximum extent possible, be consistent with the original terms of the Conservation Agreement.

D. Additional Provisions in Conservation Agreements

Conservation Agreements created to implement this Conservation Strategy should identify:

- Existing wild populations of the robust redhorse or existing inhabitable river reaches suitable for reintroduction;
- Habitat available for all life stages and habitat protection and enhancement measures that may be necessary to protect wild or introduced robust redhorse;
- Conservation measures participating non-Federal property owners are willing to undertake to conserve the robust redhorse;
- A description of the benefits expected to result from the conservation measures;
- Monitoring provisions including measuring and reporting progress and changes in habitat conditions; and
- Notification provisions to provide state natural resource agencies and the US Fish and Wildlife Service reasonable opportunity to rescue individual robust redhorse before any authorized take occurs.

VII. MEASUREMENT OF SUCCESS

The goal of the RRCC is the restoration of the *Moxostoma robustum* throughout its known range (See RRCC, 2002). In order to implement this effort effectively, the RRCC has adopted short- and long-term goals expressed in this Conservation Strategy and implemented policies to guide future actions (RRCC, 2002).

VIII. FIGURE

A. Historic range of the robust redhorse (*Moxostoma robustum*).

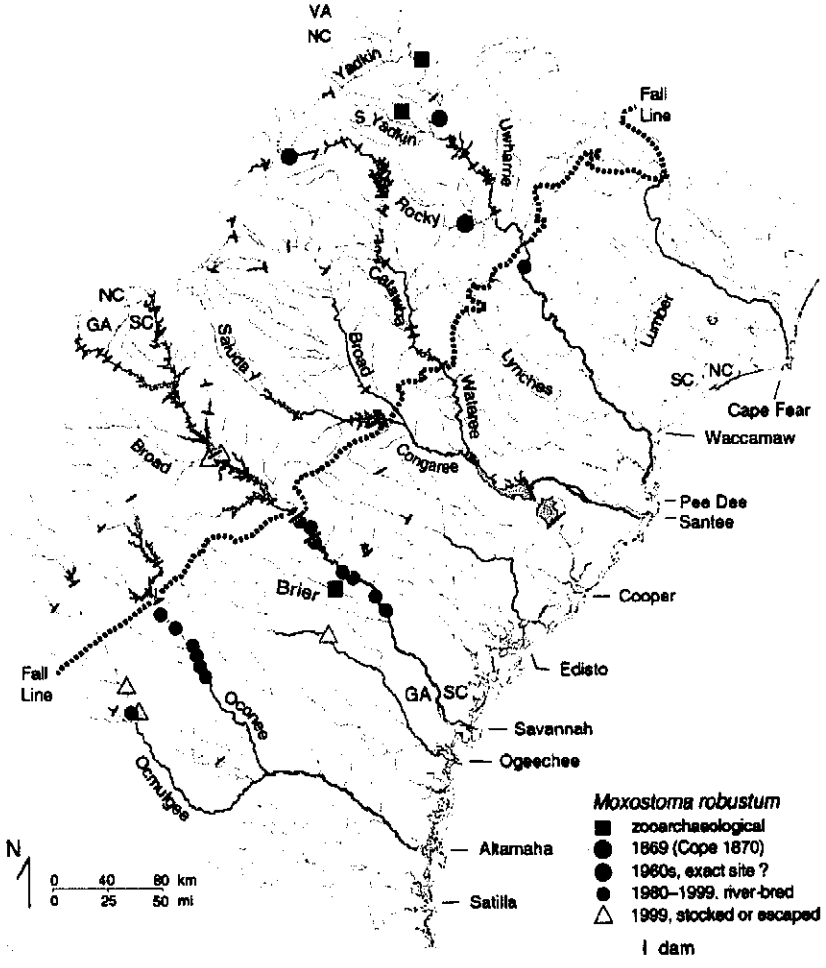


Fig. 1. Records of *Moxostoma robustum*. Number of specimens by drainage or system: Pee Dee 5; Santee 1; Savannah 42 (sites of the 4 record symbols crossed by dam symbols are below the dams); Ogeechee 1; Oconee 870 (detail in Fig. 1); Ocmulgee 3. Triangles represent artificially bred fish captured after stocking or escape from rearing ponds. Fall Line drawn from Anonymous (1963a-c) and Harris and Zullo (1991). Dams shown mainly for larger streams (south of Cape Fear drainage).

Map by R. E. Jenkins, B. J. Freeman, and J. W. Evans (October 1999)

IX. REFERENCES

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Heil, N. P. 1997. Diagnostic Reports dated July, 15, 1997 regarding robust redhorse suckers, "*Moxostoma robustum*", in "Robust Redhorse Conservation Committee Meeting, October 29-30, 1997 Report" by University of Georgia, Institute of Community and Area Development.

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Jenkins, R. E. and B. J. Freeman (in prep.). Systematics of the molar-toothed redhorse suckers (*Moxostoma carinatum*) and the rediscovered *M. robustum* of the south Atlantic slope (Pisces, Catostomidae). Unpublished manuscript.

Jenkins, R. E. (in prep.). Systematics of the brassy jumprock (*Scartomyzon brassius*, new species: formerly called *Moxostoma robustum*) of the south Atlantic slope (Pisces, Catostomidae). Unpublished.

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Jennings, C. A., J. L. Shelton, B. J. Freeman, and G. L. Looney. 1998. Annual Report (1996): Culture Techniques and Ecological Studies of the Robust Redhorse, *Moxosotma robustum.* February 1998

Jennings, C. A. , B. J. Hess, J. Hilterman, and G. L. Looney. 2000. Population dynamics of robust redhorse (*Moxostoma robustum*) in the Oconee River, Georgia. Completed for the USGS Biological Resources Division. University of Georgia Research Work Order 52.

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APPENDIX II

Examples of Adaptive Management that May Be Appropriate

A. Stock the Project Site

In the event adequate numbers of fingerlings are not available due to poor harvest, the stocking duration and monitoring period may be extended. Radio-tracking and electrofishing surveys may be rescheduled in the event of such changes.

B. Study the movement of introduced juvenile robust redhorse

Depending on the success of initial radio-tracking studies, the size and number of fish may be altered to provide the most efficient means of defining habitat utilized. Changes in radio transmitters and tracking equipment may also be required. Migration by juvenile robust redhorse is a question to be addressed by this project and will be addressed in the telemetry studies that may include tracking juvenile fish downstream of Juliette, Georgia.

C. Monitor abundance and distribution of introduced robust redhorse

Monitoring may be rescheduled if stocking schedules are altered, but monitoring for juveniles and adults returning to the project site will continue until a determination is made regarding the status of the adult refugial population (i.e., whether a population has been established or not). The primary focus of monitoring is the project site, which is believed to be the most suitable habitat for spawning robust redhorse. Monitoring under this agreement may extend downstream to the city of Macon, Georgia, if necessary.

Flathead catfish and excessive sedimentation have been identified as potential threats to the establishment of a refugial population in the Project Site. Should either of these factors be determined to have a negative effect on the success of this Agreement the Parties may act cooperatively or independently to seek any remedial actions necessary. However, the invasion of the project site by flathead catfish, and the migration of sediments from offsite sources are not under the control of Georgia Power and are outside the scope of this Agreement.

APPENDIX III

Enhancement of Survival Permit

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

3-201
(1/97)

FEDERAL FISH AND WILDLIFE PERMIT

2. AUTHORITY-STATUTES

16 USC 1539(a)(1)(A)
16 USC 1539(a)(1)(B)

REGULATIONS (Attached)

50 CFR §§ 13 & 17

3. NUMBER

TE038547-0

1. PERMITTEES

GEORGIA POWER COMPANY
241 RALPH MCGILL BOULEVARD
ATLANTA, GEORGIA 30308

TELEPHONE: 404/506-7778

4. RENEWABLE	5. MAY COPY
[X] YES	[X] YES
[ ] NO	[ ] NO

6. EFFECTIVE	7. EXPIRES
SEE BLOCK 9	12/31/2023

8. NAME AND TITLE OF PRINCIPAL OFFICER (if # 1 is a business)

MR. CHRIS M. HOBSON
VICE PRESIDENT, ENVIRONMENTAL AFFAIRS

9. TYPE OF PERMIT

CANDIDATE SPECIES - ENHANCEMENT OF SURVIVAL (EFFECTIVE THE DATE *MOXOSTOMA ROBUSTUM* BECOMES A LISTED SPECIES)

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED

THE OCMULGEE RIVER, GEORGIA, LYING DOWNSTREAM OF LLOYD SHOALS DAM AND UPSTREAM OF A LOW DAM AT JULIETTE, GEORGIA, BETWEEN RIVER MILES 250.2 AND 230.9, AND OTHER AREAS WITHIN THE OCMULGGEE RIVER SUBJECT TO PERMITTEE'S CANDIDATE CONSERVATION AGREEMENT WITH ASSURANCES (CCAA) MONITORING PROVISIONS AND AS CONDITIONED HEREIN.

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE, AND AUTHORIZED AGENTS.

D. ACCEPTANCE OF THIS PERMIT SERVES AS EVIDENCE THAT THE PERMITTEE AND ITS AUTHORIZED AGENTS UNDERSTAND AND AGREE TO ABIDE BY THE TERMS OF THIS PERMIT AND ALL SECTIONS OF TITLE 50 CODE OF FEDERAL REGULATIONS, PARTS 13 AND 17, PERTINENT TO ISSUED PERMITS. SECTION 11 OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED, PROVIDES FOR CIVIL AND CRIMINAL PENALTIES FOR FAILURE TO COMPLY WITH PERMIT CONDITIONS.

_XX_ BLOCK 11 OF THIS PERMIT CONSISTS OF ITEMS A -T (7 PAGES TOTAL).

12. REPORTING REQUIREMENTS

REPORTS WILL BE PROVIDED TO THE U.S. FISH AND WILDLIFE SERVICE OFFICES APPEARING IN CONDITIONS 11.S AND 11.T OF THIS PERMIT.

ISSUED BY

TITLE

DEPUTY REGIONAL DIRECTOR, FWS, SOUTHEAST REGION

DATE

1/9/02

ORIGINAL

E. The Permit Area will consist of those lands identified in Block 10. Within the Permit Area, activities authorized by this Permit include all actions prescribed by and associated with the implementation of the Permittee's CCAA.

F. The authorization granted by this Permit is valid from the date that *Moxostoma robustum* is listed as threatened or endangered under the Endangered Species Act of 1973, as amended, to the expiration date of this Permit and is subject to full and complete compliance with, and implementation of, the Permittee's CCAA executed by the Permittee, the Georgia Department of Natural Resources, and the USFWS.

G. The take of all *Moxostoma robustum* within the Permit Area is authorized when such take is in the form of harassment, harm, and direct mortality that results from electrofishing, sampling, holding or from any other conservation measure or other action specifically identified in the CCAA and/or this Permit.

The following additional conditions are necessary to minimize the take authorized by this Permit:

1. The Permittee shall notify the USFWS office in Condition 11.S in writing at least 30 days in advance, but preferably as far in advance as possible, of any expected incidental take of *Moxostoma robustum* under the Permit and CCAA. Such notification will provide the USFWS with an opportunity to relocate affected individuals, if possible and appropriate, thus potentially minimizing the effect of the take.

2. The Permittee shall not use gill nets, trap nets, or other passive sampling gear as part of the activities authorized by this Permit or the CCAA; active sampling gear, including seines, may be used.

3. No activities authorized or contemplated by the CCAA or this Permit shall occur when water temperatures exceed 26 degrees Centigrade, except for radio telemetry studies which may occur at any time unless capture or handling of *Moxostoma robustum* is necessary as part of those studies. If capture or handling of *Moxostoma robustum* is necessary as part of radio telemetry studies, such capture or handling shall not occur when water temperatures exceed 26 degrees Centigrade.

CONTINUED...

4. *Moxostoma robustum* sampled from the Permit Area for the purposes of implementing the monitoring provision of the CCAA shall be held for no more than 20 minutes.

5. Electrofishing power regulator settings shall not exceed 5 amps at 6 to 120 pulses per second when sampling.

6. All holding tanks (including transport tanks) shall be fitted with an oxygen supply.

H. This Permit does not authorize the incidental take of any other federally listed plant and/or animal species. In the event other federally listed plant and/or animal species are likely to be adversely affected by the Permittee's actions associated with the CCAA and this Permit, the Permittee will meet with the USFWS office in Condition 11.S to develop appropriate management or other measures that will preclude any unauthorized taking. If activities proposed by the Permittee will unavoidably result in taking of species not covered by this Permit, the Permittee has the option of formally amending this Permit by the procedures outlined in Condition 11.I.

I. The Permittee and the USFWS agree that modification and amendments to this Permit may occur. The Permit is based upon the Permittee's expected compliance with the provisions of the CCAA and Permit. Where a conflict occurs between the CCAA and this Permit, the Permit shall control.

The following procedures shall govern the modification and amendment process:

1. Either the Permittee or the USFWS may propose modifications and/or amendments to the Permit by providing written notice. Such notice shall include a statement of the reason for the proposed modification and an evaluation of the effects on the proposed modification on the CCAA, this Permit, and the covered species. This analysis shall be conducted jointly between the Permittee and the USFWS office in Condition 11.S. The Permittee and the USFWS will respond in writing to a proposed modification or amendment within sixty (60) days of the notice.

2. Any amendment or modification shall conform with all applicable legal requirements, including but not limited to the Endangered Species Act, the National Environmental Policy Act, and the USFWS's permit regulations codified at 50 CFR Parts 13 and 17.

CONTINUED...

3. The Permittee can terminate the Permit in accordance with the regulations in effect at the time of Permit issuance, now codified in 50 CFR 13.26 and incorporated herein by reference. In the event the Permittee elects to terminate the Permit before the end of its 22-year duration, the Permittee agrees to provide the USFWS with sixty (60) days advance written notice.

J. The Permittee shall provide adequate funding through the Permit expiration date or other termination. By accepting this Permit, the Permittee warrants that it has and will expend such funds as necessary to fulfill its obligations of this Permit. The Permittee will promptly notify the USFWS offices in Conditions 11.S and 11.T in writing of any material change in its financial ability to fulfill these obligations.

K. Upon locating a dead, injured, or sick *Moxostoma robustum,* or other species that may be covered by the Permit in the future under circumstances not addressed or authorized by the CCAA or this Permit, the Permittee will notify the USFWS Law Enforcement Office, Savannah Coastal Refuge Complex, 1000 Business Center Drive, Suite 10, Savannah, Georgia 31405, or phone number 912/652-4036 by the next working day. Notification must also be made by the next work day to the USFWS office in Condition 11.S. If further authorized by the USFWS Law Enforcement Office identified above, the Permittee may carefully and humanely handle sick, injured, or dead specimens to ensure effective treatment of live individuals or to preserve biological materials of deceased individuals for later analysis. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the Permittee must take responsible steps to ensure that the site where a dead or injured specimen is obtained is not unnecessarily disturbed.

L Any person who is under the direct control of the Permittee, or who is employed by or under contract to the Permittee for purposes authorized by this Permit, may carry out the activities authorized by this Permit. A copy of this Permit must be carried by the Permittee and all person(s) conducting the activities authorized under this Permit.

M. The Permittee shall ensure that all *Moxostoma robustum* that are moved to the Permit Area by the Permittee or its cooperators are tagged with tags that are standard for such activities.

N. The Permittee shall provide monitoring reports to the USFWS as described in Condition 11.O and will meet with the USFWS on an as-needed basis to review the information contained in these monitoring reports. These meetings will provide an opportunity for resolutions of disputes regarding the Permit implementation and to discuss amendments,

CONTINUED...

modifications, or adaptive management strategies related to this Permit and the CCAA. Said meetings will be mutually-agreed upon, as will a list of potential attendees and potential discussion topics.

O. Beginning with the effective date of this Permit and for the duration of this Permit, the Permittee shall submit an annual report by December 31 to the USFWS Offices in Conditions 11.S and 11.T that references Permit TE038547-0 and contains the following:

1. A certification from a responsible official who supervised or directed the preparation of the report:

   "Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete."

2. An identification of any material non-compliance of the CCAA or this Permit and all measures employed to remediate such non-compliance.

3. An accurate map depicting all portions of the Permit Area where *Moxostoma robustum* are released, reintroduced, and/or captured.

4. A summary of any modifications and/or amendments submitted and approved/denied during the reporting period, including a narrative summary of any changes made to adaptively manage for *Moxostoma robustum* within the Permit Area.

5. A report of all *Moxostoma robustum* management activities conducted within the Permit Area for the reporting period, including the number, age, and sex (if determinable) of *Moxostoma robustum* released within the Permit Area and an accounting of incidental take events which occurred during the reporting period.

6. The names and affiliations of all personnel who conducted management activities with the Permit Area for the reporting period.

P. The Permittee shall notify the USFWS in writing 30 days in advance of any transfer of ownership of Lloyd Shoals Dam (FERC Project 7019).

CONTINUED...

Q. The USFWS agrees to maintain the confidentiality of any information or data submitted by or on behalf of Permittee in the annual report required by Condition 11.N. In addition, the USFWS agrees to maintain the confidentiality of any information or data submitted by or on behalf of the Permittee pursuant to this Permit which the Permittee has designated as proprietary, commercially or financially sensitive, or confidential, to the maximum extent allowed by law. The USFWS shall provide written notice to the Permittee upon receiving a request by any other agency or party for such information or data or a record including such information or data. In the event that the USFWS determines that it may be required to disclose the information or data to the requesting agency or other party, it shall provide to the Permittee written notice thereof a minimum of twenty-one (21) working days prior to the anticipated date of disclosure, to allow the Permittee to object and to take appropriate action to seek to prevent the disclosure or assure that the requesting party will likewise maintain the confidentiality of the information or data with respect to further disclosure.

R. The Permittee and the USFWS acknowledge that changes in circumstances could arise which were not fully anticipated by the CCAA or this Permit and which may result in substantial and adverse change in the status of *Moxostoma robustum*. When determining whether changed and/or unforeseen circumstances have occurred, the determination will be made based on the USFWS's regulations regarding changed and unforeseen circumstances contained at 50 CFR 17.22(d)(5)(i-iii) and 50 CFR 17.32(d)(5)(i-iii), which are incorporated by reference and also contain the regulatory assurances provided to the Permittee by this Permit.

S. For purposes of monitoring compliance and administration of the terms and conditions of this Permit, the contact office of the USFWS is:

Field Supervisor
U.S. Fish and Wildlife Service
247 South Milledge Avenue
Athens, Georgia 30605
Telephone: (706) 613-9493
Facsimile: (706) 613-6059

T. Copies of reports and any other documentation submitted in response to the operation and management of this Permit shall also be provided to:

Endangered and Threatened Species Permits
U.S. Fish and Wildlife Service (AES/TE/P)

CONTINUED...

GEORGIA POWER COMPANY
241 RALPH MCGILL BOULEVARD
ATLANTA, GEORGIA 30308
TELEPHONE: 404/506-7778

TE038547-0

1875 Century Boulevard, Suite 200
Atlanta, Georgia 30345
Telephone: (404) 679-7110
Facsimile: (404) 679-7081

END

P:\Endangered Species\CCAA Permits\Robust Redhorse\Final Documents\Robust Redhorse CCAA Permit Page 2.final.wpd January 9, 2002 (1:54pm)

CONTINUED...

TABLE 1

Funding Conservation Actions

FILE

United States Department of the Interior

Fish and Wildlife Service

105 West Park Drive, Suite D
Athens, Georgia 30606

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560

Coastal Sub Office
4270 Norwich Street
Brunswick, Georgia 31520

AUG 1 8 2006

Mr. Mike Nichols
Environmental Laboratory Manager
Georgia Power Company
5131 Maner Road
Smyrna, Georgia 30080

Subject: Minor modification to Robust Redhorse Candidate Conservation Agreement with Assurances (CCAA); FWS Log No. NG-06-003-AGPL

Dear Mr. Nichols:

The January 2002 CCAA for the robust redhorse, *Moxostoma robustum*, was developed as a collaborative effort between Georgia Power Company, Georgia Department of Natural Resources, and the U.S. Fish and Wildlife Service (Service) in order to expedite the reintroduction of the robust redhorse into the Ocmulgee River, Georgia. The objectives of the CCAA are to 1) establish a refugial population of robust redhorse in the Ocmulgee River between Lloyd Shoals Dam and a low head dam in Juliette, Georgia, and 2) increase the understanding of habitat requirements and life history of robust redhorse.

Conservation Action 2 of the CCAA is to study the movement of introduced juvenile robust redhorse. In March 2006, ten adult robust redhorse were collected from the Broad River at Anthony Shoals. These older fish provide an opportunity to study movement by radiotelemetry and were readily available. On March 14, 2006, the Robust Redhorse Conservation Committee (RRCC) Executive Committee was contacted to review a proposal to use these fish from the Broad River and any additional fish collected from the Ogeechee River for the telemetry project that was designed to meet the purposes of Conservation Action 2. The Service was contacted March 15, 2006, regarding the need to discuss and document changes to the telemetry project.

Ross Self, current chair of the RRCC, indicated that based on the input of the Executive Committee there was consensus to use the Broad River and Ogeechee River fish for this study (email dated March 20, 2006). Twenty-three additional fish were collected from the Ogeechee River in April 2006 for this telemetry project. Based on the review and input regarding the proposed change, we concur with this modification to the proposed telemetry project, which is part of Conservation Action 2 of the "CCAA for the Robust Redhorse, *Moxostoma robustum*, Ocmulgee River, Georgia". This modification is in accordance with the "Adaptive Management"

section of the CCAA, which states the parties to the CCAA may request modifications to the conservation actions.

We appreciate the opportunity to provide comments as this project moves forward. If you have any questions, please contact staff biologist Alice Lawrence at (706) 613-9493 ext. 222.

Sincerely,

Sandra S. Tucker
Field Supervisor

Cc: Ross Self, GDNR, Columbia, SC
Jimmy Evans, GDNR, Fort Valley, GA
Cecil Jennings, USGS Biological Resources Division, Athens, GA
Tim Grabowski, USGS Biological Resources Division, Athens, GA

United States Department of the Interior

Fish and Wildlife Service

105 West Park Drive, Suite D
Athens, Georgia 30606

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560

Coastal Sub Office
4270 Norwich Street
Brunswick, Georgia 31520

FILE

January 3, 2007

Mr. Joe Slaughter
Fisheries Biologist
Georgia Power Company
5131 Maner Road
Smyrna, Georgia 30080

Subject: Modification to Robust Redhorse Candidate Conservation Agreement with Assurances (CCAA); FWS Log No. 41460-2008-FA-0024

Dear Mr. Slaughter:

The January 2002 CCAA for the robust redhorse, *Moxostoma robustum*, was developed as a collaborative effort between Georgia Power Company (GPC), Georgia Department of Natural Resources (GDNR), and the U.S. Fish and Wildlife Service (Service) to expedite the reintroduction of the robust redhorse into the Ocmulgee River, Georgia. The objectives of the CCAA are to 1) establish a refugial population of robust redhorse in the Ocmulgee River between Lloyd Shoals Dam and a low head dam in Juliette, Georgia, and 2) increase the understanding of habitat requirements and life history of robust redhorse.

Conservation Action 1 of the CCAA is to stock the Project Site. The CCAA states that GDNR will stock the Project Site with approximately 4,000 hatchery-reared robust redhorse fingerlings each year for five years, totaling 20,000 fingerlings. At the inception of the CCAA, this number of fingerlings was selected based on population modeling to result in approximately 600 adult fish, which correlated at that time to the population estimate in the adjacent Oconee River. The CCAA has now been enacted for five years, and through 2007, a total of 13,228 fingerling and juvenile robust redhorse have been stocked in the Project Site. At the RRCC Annual Meeting on September 24-25, 2007, the RRCC discussed the need to modify the existing CCAA regarding the stocking requirements contained therein. This discussion was based on several factors: 1) GDNR and the Service will not be propagating robust redhorse from the Oconee River population in spring 2008 because of the low numbers of broodfish that have been captured in recent years, 2) monitoring results from the Ocmulgee River indicating that individuals are surviving and a large percentage are remaining within the CCAA project site, 3) sampling results of the Broad, Ocmulgee, and Ogeechee Rivers indicating that these individuals are surviving and are exhibiting suitable growth, 4) research indicating that robust redhorse stocked from the Broad and Ogeechee rivers, Georgia into the Ocmulgee River, Georgia are behaving similarly to the existing Ocmulgee River stocked population, and 5) recent observations of spawning activities in the Ocmulgee and Broad rivers.

On October 10, 2007, the Service, GDNR, and GPC participated in a conference call to discuss options to address the stocking requirements contained in Conservation Action 1 of the CCAA.

While the parties do not feel that spawning of the Oconee River population in spring 2008 solely for CCAA purposes is justified, they feel that stocking of the Ocmulgee River should continue, when feasible. Stocking a much smaller number of older fish into the Ocmulgee would be appropriate, such as from the Ogeechee and/or Broad rivers, because older fish will have a greater survival rate to adulthood than fingerlings. However, fish that become available in the Broad and Ogeechee Rivers are often needed for other purposes, such as research projects. Therefore, the parties decided that stocking of the Ocmulgee River population from the Ogeechee and/or Broad River populations should continue, dependent on the non-conflicting availability of these individuals. A target number was not established because monitoring results from the Ocmulgee River indicated that the numbers presently stocked may be sufficient to establish a successful refugial population and recent spawning activity suggests that the population may eventually become sustainable. Additional stockings of adult fish from the Ogeechee and/or Broad River would be primarily to increase the probability of success of the stocking program and to increase genetic diversity of the introduced population.

On October 30, 2007, the Robust Redhorse Conservation Committee (RRCC) Executive Committee was contacted to review the proposal to modify the stocking requirements that were designed to meet the purposes of Conservation Action 1. Although a target number will not be set, the proposed stocking modification would be that stocking of the Ocmulgee River should continue, depending on the non-conflicting availability of robust redhorse. Dave Coughlan, current Chair of the RRCC, indicated there was consensus support among the Executive Committee members for this proposed stocking modification (email dated January 2, 2007). Based on the review and input regarding the proposed change, we concur with this modification to the stocking requirements, which is part of Conservation Action 1 of the "CCAA for the Robust Redhorse, *Moxostoma robustum*, Ocmulgee River, Georgia". This modification is in accordance with the "Adaptive Management" section of the CCAA, which states the parties to the CCAA may request modifications to the conservation actions.

We appreciate the opportunity to provide comments as this project moves forward. If you have any questions, please contact staff biologist Alice Lawrence at (706) 613-9493 ext. 222.

Sincerely,

Sandra S. Tucker

Sandra S. Tucker
Field Supervisor

Cc: Dave Coughlan, Duke Energy, Huntersville, NC
Jimmy Evans, GDNR, Fort Valley, GA