RECOVERY PLAN

Notropis cahabae

Cahaba Shiner

U.S. Fish and Wildlife Service

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Recovery Plan

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for

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Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the listed species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery tasks.

Literature citation should read as follows:

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EXECUTIVE SUMMARY

Current Species Status: The Cahaba shiner was listed as endangered on October 25, 1990. It occurs in up to 60 miles of the mainstem Cahaba River, with the population center restricted to 15 river miles. The species could be extirpated by any event that resulted in a massive fish kill within its known range.

Habitat Requirements and Limiting Factors: The major threat is water quality degradation from wastewater effluents, methane gas drilling operations, and sedimentation. The species may be extra sensitive to chlorine and other chemicals in treated wastewater.

Recovery Objective: The objective is to reclassify this species to threatened status.

Recovery Criteria: This species may be reclassified when the Cahaba shiner occurs in numbers that allow the capture of at least 5 per hour with the use of a 12 foot seine in suitable habitat throughout the 76 miles of historic range; populations are documented to be viable over 10 years; and the Cahaba River drainage is protected from water quality degradation.

Actions Needed:

1. Determine the impact of effluents.
2. Determine life history of the Cahaba shiner.
3. Restore and protect historic habitat.
4. Monitor the population.

Total Estimated Cost of Recovery: Total cost of most recovery efforts identified in this recovery plan is estimated at $405,000. However, the cost of the most expensive task, restoration and protection of habitat, is not included in the estimate since this task will likely require new technology for wastewater treatment.

Date of Recovery: Reclassification of this species may be considered after populations are documented as viable over a 10-year period. The time required to attain the objective is dependent upon restoring habitat and cannot be estimated at this time.

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PART I: INTRODUCTION

The Cahaba shiner, a cyprinid, is endemic to the mainstem Cahaba River, Alabama. Its range has been reduced from approximately 76 river miles to 60 river miles with most of the population in only 15 river miles. The range reduction resulted from, and the continued threat is, water quality degradation from urbanization and sedimentation. The Cahaba shiner was listed as endangered in the Federal Register on October 25, 1990 (U.S. Fish and Wildlife Service 1990).

Description

The Cahaba shiner (Notropis cahabae) was described in 1989 (Mayden and Kuhajda 1989). This species is a small, delicate-bodied, silvery-colored shiner about 2.5 inches (6.35 centimeters) long with a peach-colored narrow stripe over the dark lateral stripe. The Cahaba shiner differs from the mimic shiner (N. volucellus) (a closely related species) in coloration and pigmentation. The Cahaba shiner's lateral stripe does not expand before the caudal spot, it has no predorsal dark blotch, the dorsal caudal peduncle scales are uniformly dark and pigmented, and predorsal scales are broadly outlined and diffuse (Mayden and Kuhajda 1989). The mimic shiner has an expanded lateral stripe on the caudal peduncle, an evident predorsal stripe and spot, dorsolateral scales that are outlined, and caudal peduncle scales that are more heavily pigmented posteriorly (Mayden and Kuhajda 1989).

Distribution

The Cahaba shiner has been collected in Alabama in about 76 miles (122 kilometers (km)) of the Cahaba River (Figure 1) from 3 miles (4.8 km) northeast of Heiberger in Perry County to Highway 52 bridge near Helena in Shelby County (Ramsey 1982, Pierson et al. 1989). Ramsey (1982) speculates that the Cahaba shiner had a wider historical distribution that possibly included the Coosa River. The present known range of about 60 miles (96 km) extends from 3 miles (4.8 km) northeast of Heiberger in Perry County (Pierson et al. 1989) to 3.75 miles (6 km) above Booth Ford in Shelby County (Howell et al. 1982). This represents a range reduction of over 20 percent that occurred between 1969 and 1977 (Ramsey 1982). Further population reductions are evident, as the stronghold for the species is now limited to about 15 river miles (24 km) between the Fall Line and Piper Bridge in Bibb County. Even within the current known range, some investigators believe the number of Cahaba shiners has declined. Cahaba shiners below the Fall Line may represent waifs, rather than a reproducing population.

Life History/Ecology

A diversity of habitats have been surveyed by ichthyologists to identify Cahaba shiner habitat. Ramsey (1982) searched large tributaries of the Cahaba River and small rivers of the upper Mobile River system. The habitat of the Cahaba shiner appears to be large shoal areas in the main channel of the Cahaba River (Howell et al. 1982). The species is found in the quieter waters, less than 1.6 feet (0.5 meters) deep, just below swift riffle areas (Howell et al. 1982). The Cahaba shiner seems to prefer sandy patches in

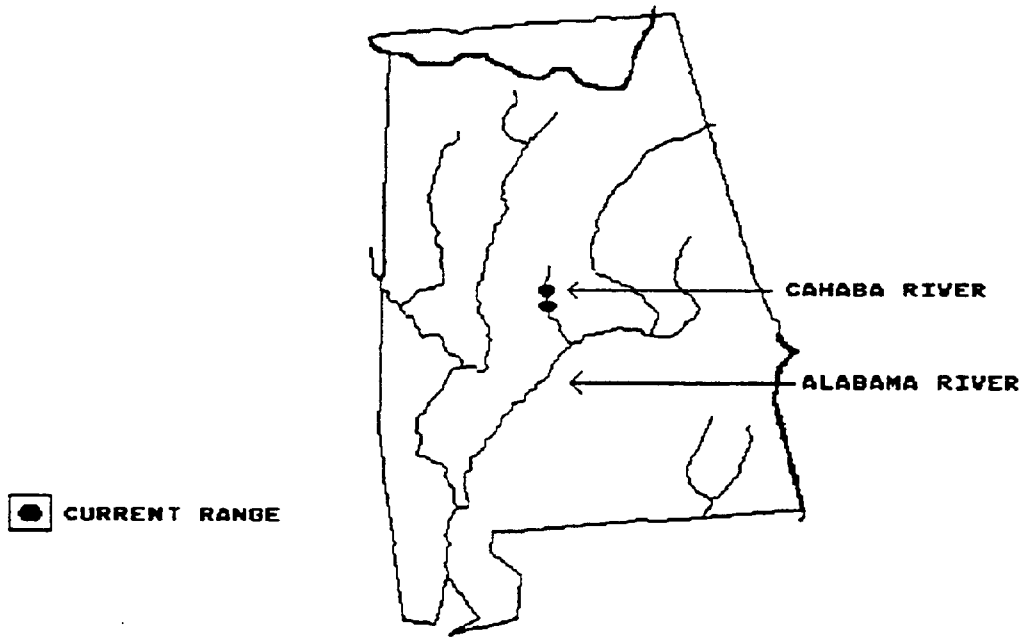

Figure 1

Current Range of the Cahaba Shiner

ALABAMA

gravel beds or downstream of larger rocks and boulders. The species is generally found in relatively clear, well oxygenated water. It probably requires a river with sufficient small crustaceans, insect larvae, and algae for food, similar to its close relatives (Gilbert and Burgess 1980).

The Cahaba shiner's reproductive biology seems consistent with other fish in the mimic shiner group, spawning much later than do most other North American cyprinids. They appear to spawn from late May through June and have a more limited spawning period compared to other fish of similar size. Pre-spawning aggregations have been observed at the tail of a long pool, in a moderate current at 1.2 to 2.0 feet (0.36 to 0.61 meters) deep, just before the current quickens at the head of the main riffle (Ramsey 1982).

Reasons for Listing

Degradation of water quality in the Cahaba River has and continues to have the greatest adverse impact to the Cahaba shiner (O'Neil 1983). The limited range, scattered populations, and low numbers of the Cahaba shiner have been known since its discovery (Miller 1972, Ramsey et al. 1972, Ramsey 1976, Stiles 1978, Howell et al. 1982, Ramsey 1982, Ramsey 1986). Historic populations of the Cahaba shiner have been seriously affected by urbanization, sewage pollution, and strip-mining activities in the upper Cahaba River Basin.

In the Cahaba River Basin there are 10 municipal wastewater treatment plants, 35 surface mining areas, one coalbed methane and 67 other permitted discharges (Alabama Department of Environmental Management in litt. 1990). Sewage that has received tertiary treatment is still high in nutrients and can contribute to eutrophication of an aquatic system. Not all plants provide tertiary treatment to their wastewater, nor are many capable of treating the heavy inflow that occasionally occurs. During periods of heavy inflows (i.e., rainfall, etc.), the capacity of some plants may be exceeded, resulting in wastewater bypassing at least some treatment stages. Ramsey (1982) observed an increase in blue-green algae, an indicator of water quality degradation, at several localities since he began collecting on the Cahaba River in 1962. The effect of such eutrophication on the fauna is intensified in still pools, during low flows and high temperatures, when dissolved oxygen drops to low levels. During low flows, virtually all of the water flow in some stretches of the Cahaba River consists of treated sewage effluent until augmented by tributaries downstream.

Because of the number of sewage treatment plants within the Cahaba River system, chlorination could have an adverse impact on the Cahaba shiner. Paller et al. (1988) determined that fishes were more diverse in secondary wastewater effluents without chlorination than in those where chlorine was used. The use of chlorine for filter cleaning during tertiary treatment produced a decrease in weight and number of fish per sample but did not change the number of species collected. Ramsey (1982) has speculated that the Cahaba shiner may be more sensitive to chlorine than are other species.

There is considerable interest in methane gas extraction in the Cahaba River Basin. The 2-year extension of tax incentives for methane gas extraction is expected to increase interest in that activity. Permitted discharge limits (based on chlorides, pH, and dissolved oxygen) are designed to maintain the fish and wildlife quality of the Cahaba River. However, the potential for the discharge of wastewater from these wells in excess of permitted levels and the subsequent impact on the Cahaba shiner is a concern.

We do not know the impact of other pollutants that may be in wastewater from methane gas wells. Permitted discharge limits are based upon chlorides and there are other compounds that may be more detrimental to the biota, individually or synergistically. With this consideration, the basis for establishing water quality limits and monitoring permitted discharge is also a concern. The fish species used for toxicity testing and monitoring is the fathead minnow, Pimephales promelas. This species is known to be very hardy and tolerant of water quality degradation. It is not native to the Cahaba River system and may not be representative of native species. In addition, there are no mollusks used in the toxicity testing and this important group may serve as food for some fish during some life stages. Protection of a species must include protection of its food source. There is some indication that potential food species may be more sensitive to chlorides than are the Cahaba shiner or other fish species that may be used for toxicity test purposes (Dr. Richard Mayden, University of Alabama, pers. comm. 1990).

Water quality in the Cahaba River is further affected by siltation from surface mining, road construction, and site preparation for drilling operations. Recent fish collections in the Cahaba River have shown a significant decrease in species diversity and density as the siltation increased. Stiles (1990) observed considerable sediment in the Little Cahaba and Cahaba Rivers and commented that it may be a major reason for the decline of fish species diversity. The Cahaba shiner has declined as a result of these impacts and continues to be affected by many of them.

Water quality standards serve to protect aquatic fauna, but only when those standards are maintained. Records for dissolved oxygen in the Cahaba River near West Blocton have documented levels as low as 2.9 milligrams/liter (mg/l). (R.C. Haddock, Cahaba River Society, in litt. 1992). The required minimum level for dissolved oxygen in the Cahaba River is 5.0 mg/l. The Cahaba shiner has experienced a substantial decline in the Cahaba River near West Blocton.

Conservation Measures

The U.S. Fish and Wildlife Service (Service) has contracted with the Alabama Department of Conservation and Natural Resources to begin population monitoring that will develop a baseline for evaluating population trends and recovery efforts. The Geological Survey of Alabama has completed a 2-year study of water quality in the Cahaba River with sampling stations within the range of the Cahaba shiner. The data from that study has resulted in a cooperative study between the Service and Geological Survey of Alabama to evaluate water quality and species diversity at points upstream of the Cahaba shiner's range.

PART II: RECOVERY

A. Objective

The objective of this plan is to reclassify the Cahaba shiner to threatened status. This species may be reclassified as threatened when the Cahaba shiner occurs in numbers that allow the capture of at least 5 per hour with the use of a 12 foot seine in suitable habitat throughout the 76 miles of historic range; populations are documented to be viable over 10 years; and the Cahaba River drainage is protected from water quality degradation.

Protected is defined as having enough control over the geographic area in question that adverse impacts are unlikely to occur.

A viable population is defined as having the reproductive capability to sustain itself without immigration of individuals from other populations.

The reclassification criteria are preliminary and may be revised on the basis of new information.

B. Narrative Outline for Recovery Actions Addressing Threats

1. Determine impacts of permitted effluents. The greatest threat to the Cahaba shiner is water quality degradation. Impacts to this species from most of the permitted effluents are unknown. This task will seek to provide necessary information to evaluate this threat.

   1.1 Determine impacts of methane gas produced wastewater effluents. The extension of tax incentives for methane gas production is expected to increase interest in the Cahaba River basin. Only very limited evaluation of wastewater from this source has been conducted. None of that investigation used methane gas produced wastewater from the Cahaba River basin, nor did it use test species that are closely related to the Cahaba shiner and native to the Cahaba River. Evaluation of these impacts should also include those species that are food items for the Cahaba shiner (Task 2.1). The chemical composition of methane gas produced wastewater should be determined and the effects on shiners and their food organisms evaluated. This evaluation should include individual components of the wastewater and the possible synergistic effect of the total effluent using a closely related test species.

   1.2 Determine impacts of chlorination. Preliminary evidence indicates the permitted levels of chlorides in wastewater are safe for shiners. However, studies of chlorination in wastewater treatment indicate that species diversity and abundance increase when wastewater is not chlorinated (Paller et al. 1988). The effects of chlorination on shiners and their food organisms, including the cumulative impact of multiple mixing zones on the available habitat, should be evaluated.

1.3 Determine impacts of effluents on the eutrophication of the Cahaba River. Many wastewater treatment plants and other permitted discharges continue to contribute nutrients to the Cahaba River. A full evaluation of the combined effects of these discharges should be considered. With this determination, a coordinated plan to alleviate adverse impacts can be developed by the appropriate entities.

1.4 Determine impacts of other discharges into the Cahaba River. Existing urban runoff and other nonpoint source discharges may be the source of a variety of toxicants, including heavy metals. These discharges are largely unregulated and the components unknown. This task should seek to determine the chemical constituency of nonpoint source discharges and the impacts of these discharges on the Cahaba River ecosystem.

2. Determine life history of the Cahaba shiner. Protection and recovery of this species requires the understanding and protection of the entire life history requirements.

2.1 Determine the food organisms. Any effort to protect this species must also protect the food organisms. It is probable this small fish feeds upon snails and other mollusks during their early life stages. Preliminary evidence indicates that snails are much more sensitive to chlorides than is the shiner. To fully protect the shiner, the Cahaba River must be maintained in a condition that perpetuates the natural diversity of food organisms. This task will consider determination of the food organisms of the Cahaba shiner.

2.2 Determine life history requirements. Very little, if anything, is known about the life history requirements of the Cahaba shiner. Such basic things as the life expectancy, age at maturity, spawning period and habitat, reproductive capacity, and other related facts should be determined.

3. Develop and implement a plan to restore and protect historic habitat. Working with the appropriate agencies, both Federal and State, the entire historic habitat should be restored to conditions that allow the Cahaba shiner to recolonize that area. This may require improved wastewater treatment technology in many instances and a commitment by all concerned parties to use that technology for the benefit of the shiner and all other users of the Cahaba River. Alternate technology exists for many of the discharges, or potential discharges, that are contributing to water quality degradation in the Cahaba River.

3.1 Develop a plan to restore historic habitat. Working with development interests, a plan to restore the water quality of the Cahaba River should be prepared. This plan should include methods of treating wastewater that ensure effluents will not adversely affect the Cahaba shiner or its food organisms.

Development of this plan may call for new technology in the treatment of municipal sewage wastes.

3.2 Implement the plan to restore historic habitat. Implementation of the plan developed in Task 3.1 should restore and protect the historic habitat of the Cahaba shiner. Reproductive capacity of the remaining Cahaba shiners is sufficient to repopulate the historic range.

4. Monitor the population. Protection of this species requires that we know population trends and that we take action when a downward trend is indicated. This task will consider monitoring Cahaba shiner populations by sampling at select locales within the entire historic range each year. Sample techniques should be such that comparisons of the data are relevant. Annual monitoring should be conducted so as to prevent mortality of any Cahaba shiners.

4.1 Develop a base from which to evaluate population trends. A systematic sampling program would provide information on the population as it currently exists. This base would allow future sampling to determine population trends of the Cahaba shiner. In this task, a systematic sampling method and sites for annual sampling should be developed using the expertise of ichthyologists who routinely work in riverine systems.

4.2 Annually monitor the population to track population trends. Following development of the population base, the population should be sampled annually to determine trends. Sampling should be by the methods developed in Task 4.1 and include, at a minimum, the sites in that task. Periodic sampling outside the current range or in areas where the population is minimal should provide information on recovery of the species. As the species range expands, the area sampled each year must also expand.

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PART III: IMPLEMENTATION SCHEDULE

Priorities in column one of the following implementation schedule are assigned as follows:

1. Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

2. Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

3. Priority 3 - All other actions necessary to meet the recovery objective.

Key to acronyms used in Implementation Schedule

FWE - Fish and Wildlife Enhancement, U.S. Fish and Wildlife Service
RES - Division of Research, U.S. Fish and Wildlife Service
EPA - Environmental Protection Agency
ADCNR - Alabama Department of Conservation and Natural Resources
COE - U.S. Army Corp of Engineers
ADEM - Alabama Department of Environmental Management
ECE - Environmental Contaminants Evaluation, U.S. Fish and Wildlife Service

IMPLEMENTATION SCHEDULE

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE PARTY			COST ESTIMATES ($K)			COMMENTS/NOTES *
				USFWS						
				Region	Division	Other	FY 1	FY 2	FY 3	
1	1	Determine impacts of permitted effluents	3 years	4	FWE, RES, ECE	ADEM, EPA ADCNR	100	100	100	
2	2	Determine life history	5 years	4	FWE, RES	ADEM, EPA, ADCNR	25	25	25	
1	3	Restore and protect historic habitat	Continuous	4	FWE, RES	ADEM, EPA, ADCNR, COE				Cost estimates for this task are not possible since new technology may be necessary for treatment of wastewater.
2	4	Monitor the population	Continuous	4	FWE, RES	ADEM, EPA, ADCNR	10	10	10	

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