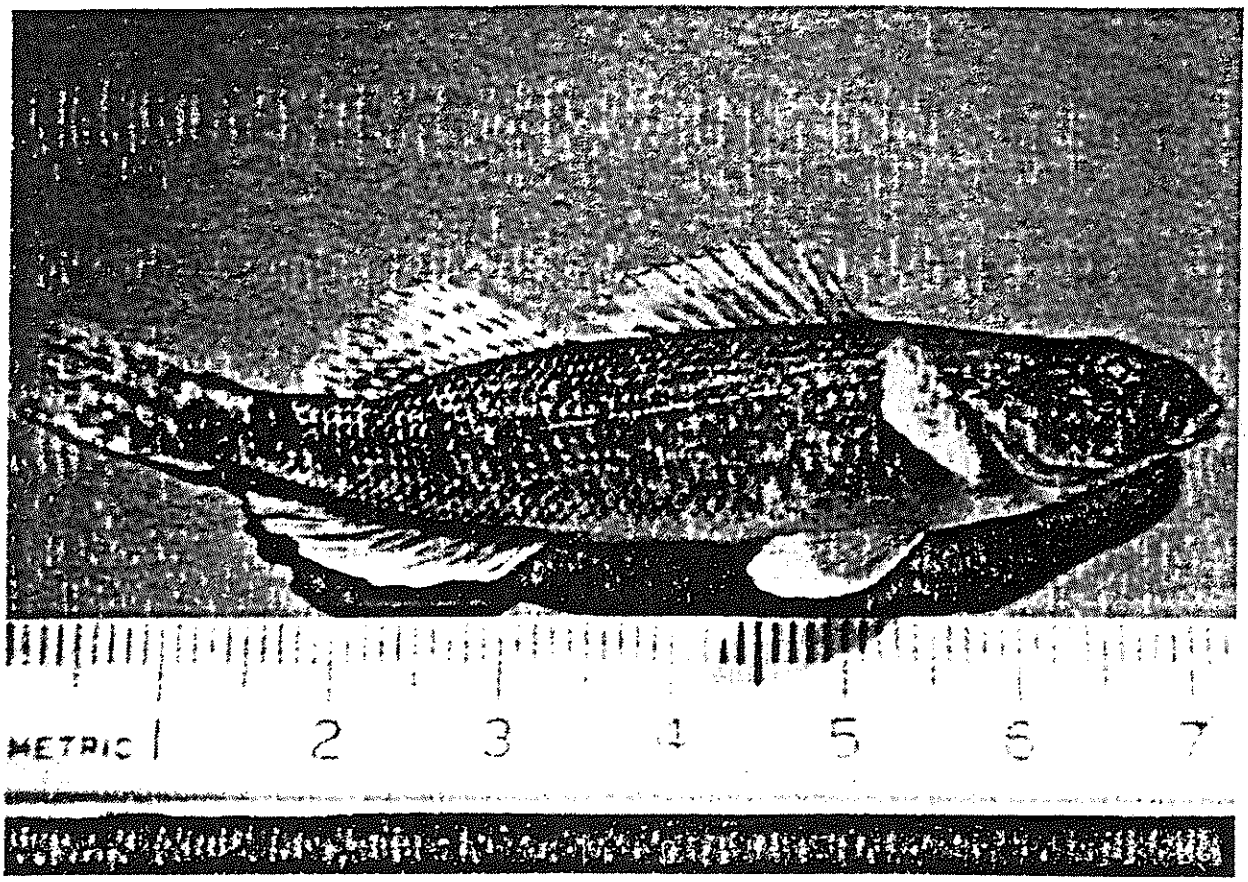
Snail Darter



RECOVERY PLAN

SNAIL DARTER RECOVERY PLAN

Prepared by
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April 4, 1979
revised
by Recovery Team
December 5, 1979

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December 17, 1982

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Date: May 5, 1983

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TABLE OF CONTENTS

INTRODUCTION

History of the Tellico Dam Project's Snail Darter Litigation Problem

Funds for construction of the Tennessee Valley Authority's Tellico Dam Project were first made available by Congress in 1942; however, resource commitment priorities for World War II prohibited construction. Funds were again appropriated by Congress on October 15, 1966, and construction started on May 7, 1967. By October 18, 1968, construction of the concrete portion of the dam across the left (south) channel around Bussel Island was completed. Construction on the earthen portion of the dam and other elements of the project continued, and by August, 1975, flow around the right (north) side of Bussel Island had been stopped with the installation of coffer dams forcing the entire flow of the river through the sluice gates in the concrete structure.

In the interim, Dr. Etnier collected the first specimens of the snail darter in August 1973 and the Endangered Species Act of 1973 became law on December 28, 1973.

A petition to list the fish as an endangered species was submitted to the U.S. Fish and Wildlife Service on January 20, 1975. Official notification that the species would be listed as endangered was published in the October 9, 1975, Federal Register, to become effective November 10. In his review, the Secretary of the Interior determined that the proposed impoundment of Tellico Reservoir would result in total destruction of the snail darter's habitat. Designation of Critical Habitat, to include the reach from miles 0.5 to 17 (kilometers .08 to 27.4) on the Little Tennessee River, was proposed on December 16, 1975, and became effective on April 1, 1976.

A suit was filed against TVA in the Federal District Court in Knoxville on February 18, 1976, by citizens seeking preliminary and permanent injunctions to halt construction of the Tellico project on the grounds that further construction and completion of the project would violate the Endangred Species Act by destroying the only known habitat of the snail darter. A full trial on the merits of the case was held on April 29-30, 1976; and on May 25, 1976, the district court denied the requested injunction and dismissed the case concluding that the Endangered Species Act was not intended to prohibit the completion of a project that was authorized and begun seven years before the Act was passed and which was 80 percent complete at the time of trial. Upon appeal, the Sixth Circuit Court reversed the decision and held that the closure of the dam, since it would adversely modify the Critical Habitat of the snail darter, would violate the Endangered Species Act; and that Congress had not exempted the Tellico project from compliance. On this basis, an injunction was ordered and subsequently issued by the lower court on February 24, 1977, halting further construction.

The case was then argued before the Supreme Court. On July 15, 1978, this court affirmed the judgment of the U.S. Sixth Circuit Court of Appeals and rendered the opinion that completion of the Tennessee Valley Authority's Tellico Dam project on the Little Tennessee River would significantly modify the Critical Habitat of the snail darter, Percina tanasi Etnier, and thus violate the Endangered Species Act of 1973. The court recognized the conflict between enactment of laws such as the Endangered Species Act and authorization of resource development actions such as water control projects and stated that such conflicts should be resolved by Congress.

Following the Supreme Court decision, an Interagency Tellico Task Force (U.S. Department of the Interior and the Tennessee Valley Authority) was established to examine the costs and benefits of all reservoir and river-based development options as alternatives for completing the Tellico project. These alternatives included: (1) impoundment as originally planned, (2) tributary impoundment, (3) river development retaining the dam as a "dry" dam for flood control purposes, and (4) river development with the earth portion of the dam removed. The Task Force recognized, as integral to the assessment of the alternatives, the consideration of actions designed to remove the snail darter from jeopardy. Accordingly, at their recommendation, a Snail Darter Recovery Team was appointed to draw up a comprehensive plan designed to remove the snail darter from threat of extinction.

Evolution of the Recovery Plan

Originally the Recovery Team developed a plan which addressed each Task Force alternative (except tributary impoundment) for completion of the Tellico project with full consideration of the impact of each alternative on the snail darter. A plan was not developed for tributary improvement since it was judged to have similar impacts as the dry dam alternative.

The team agreed that the alternative of partial dam removal was clearly the most biologically appropriate for preservation of the snail darter in its Critical Habitat. Other options followed in order of priority. They were: (1) river development with use of the dam for flood control only, (2) use of the dam for flood control along with construction of a tributary dam on the Tellico River, and (3) impoundment as originally planned.

In November, 1978, amendments to the Endangered Species Act of 1973 created an Endangered Species Committee to review for possible exemption any resource development projects of regional or national significance in which there is an unresolvable conflict with the Act. The amendments specifically directed the Committee to review TVA's Tellico Task Force. The Committee on February 7, 1979, voted unanimously not to exempt the Tellico Project from the Act. This decision was made following review of proposed mitigation and enhancement measures for the snail darter (transplantation, artificial propagation, etc.) and in effect eliminated all alternatives except partial removal of the dam.

The first draft Recovery Plan therefore addressed species recovery related to the dam removal or "river development" option. However, in July, 1979, the House of Representatives passed a Bill exempting the Tellico Project from the Endangered species Act and all other applicable laws. This Bill was subsequently passed by the Senate and signed into law on September 25, 1979, by the President.

With this Bill passed and signed into law, it was obvious that the option of impoundment of the Little Tennessee River would be exercised. Under this option, the removal of this species from the threat of extinction would depend upon transplantation of the Little Tennessee River population into other waters, preferably within its presumed former range, and establishment of at least three separate populations in these waters. Habitats within the Tennessee River drainage adjacent to the presumed former range would be considered if necessary. This adjacent area would include the Tennessee River and tributaries down to the Pickwick Landing Dam.

The Team then prepared a draft recovery plan to address this course of development and in drafting the plan addressed only biological considerations.

In November of 1980, snail darters were discovered in South Chickamauga Creek and additional sampling indicated that the species existed in the lower 19.4 miles of the creek in Tennessee and Georgia. Subsequent sampling in the Tennessee River and its tributaries revealed snail darters inhabiting three other Tennessee River tributaries and some areas within the main stem of the Tennessee River.

These discoveries, along with changes in recovery planning guidelines implemented by the U.S. Fish and Wildlife Service, required that the recovery plan be revised. Rather than burden the Recovery Team with these revisions, the Fish and Wildlife Service's Asheville Endangered Species Field Office was assigned this task and they have completed the plan in consultation with the Recovery Team.

Biological data on the snail darter presented in this plan come from the following four major sources. Citation has been omitted (with some exception to allow for easier review).

Etnier, David A. 1976. Percina (Imostoma) tanasi, a new percid fish from the Little Tennessee River, Tennessee. Proc. Wash. Biol Soc. 88(44):469-645.

Eager, Richard 1982. A report on the status of the endangered snail darter, Percina tanasi. U.S. Fish and Wildlife Service unpublished report. 55p.

Hickman, Gary D. and Richard B. Fitz 1978. A report on the ecology and conservation of the snail darter (Percina tanasi Etnier) 1975-1977. Technical note B28. July 1978 Tenn. Valley Authority, Norris, Tenn. 37828. 130p.

Starnes, Wayne C. (1977). The Ecology and Life History of the Endangered Snail Darter, Percina (Imostoma) tanasi Etnier. TWRA Technical Report No. 77. 144 pgs.

SPECIES ACCOUNT*

Discovery and Description

In August 1973, Dr. David Etnier, Professor of Zoology, The University of Tennessee, was snorkeling in the lower reaches of the Little Tennessee River observing the faunal characteristics of the river which was proposed for impoundment by TVA. This reach of river had received little attention from biologists over the years. While snorkeling over a gravel shoal 11 kilometers above the mouth of the river, Dr. Etnier captured a darter specimen of a species he had never seen before. Subsequent specimens collected with seines indicated the fish was a darter of the subgenus Imostoma, genus Percina. After further work, Dr. Etnier described the new darter as Percina (Imostoma) tanasi.

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*Discussions of range, habitat, distribution and life history of the snail darter in this section apply primarily to conditions found prior to impoundment of the Little Tennessee River by Tellico Dam.

In summarizing his rationale for the full-species taxonomic status of the snail darter, Etnier (1976) says:

> The populations of saddle-backed Imostoma in the Little Tennessee River differs from known populations of P. uranidea in body width, paired fin length, saddle width, nuptial tubercule pattern, several aspects of pigmentation, number of anal and caudal fin rays, and probably vertebral number. I assume that genetic differences are responsible for most, if not all, of this divergence. That this divergence is sufficiently large to justify recognition of the Little Tennessee River population as a distinct species is suggested by several sources of information besides the characters listed above. A useful clue to the probable taxonomic status of allopatric populations involves comparing the amount of divergence between such isolates with that between similar sympatric species in the same group. P. uranidea and P. ouachitae are sympatric in both the White and Saline river systems. The observable differences between these sympatric species (not recognized by modern ichthyologists as being distinct until 1970) are similar in magnitude to those between P. uranidea and P. tanasi. This indicates that striking differences are not prerequisite to maintenance of genetic isolation between sympatric Imostoma. Since the Wabash River population of P. uranidea does not display character states intermediate between those of Ozarkian populations and P. tanasi..., clinal differences are not involved.

Generally, the fish can be characterized as being robust, rarely exceeding a total length of 85 mm with a mean adult weight of approximately 5 gm. Background color above the lateral line is brown with occasional faint traces of green, with the area behind the dorsal fin origin being crossed by four prominent dark brown saddles. Below the lateral line the background becomes lighter and is interspersed with dark blotches. The belly is usually white. Dorsal areas of the head are dark brown. The cheeks are mottled brown interspersed by traces of yellow.

Historical Distribution

It is impossible to determine the former range of the snail darter, as there are essentially no preimpoundment collections from the main channel of the Tennessee River or its major tributaries. It can be speculated with

some confidence, however, that snail darters were confined to upper portions of the Tennessee River drainage, including the main channel and lower reaches of major tributaries. This assumption is based on the fact that snail darters are apparently absent from extant gravel shoal habitats in larger tributaries to the lower Tennessee River (Duck, buffalo, and possibly Elk rivers) and still occur in selected Tennessee River areas and tributaries from the Paint Rock River upstream to Fort Loudoun Dam. The range of the snail darter prior to impoundments probably included suitable portions of the main channel Tennessee River, from perhaps north-central Alabama upstream, and the lower few kilometers of the Hiwassee, Clinch, Little Tennessee, French Broad and Holston rivers.

Habitat in the Little Tennessee River Proir to Impoundment

The Little Tennessee River above Watts Bar was regulated by Chilhowee Dam located 53 kilometers above the mouth. Cold water discharges from Chilhowee created typical trout water over the upper 22 kilometers. Substrate in this reach was predominantly ledge rock, small boulders, and some areas of mixed sand and gravel. All areas were essentially silt free.

Water quality in the basin and the watershed below Chilhowee Dam was excellent. There were virtually no industrial effluents entering the system as most of the area drained is in the rugged southern extremity of the Appalachian Mountains including Great Smoky Mountains National Park. Limited agricultural activities and some timber operations above Chilhowee Reservoir provided the potential for increased turbidity in the system, but for the most part, suspended solids settled out in Chilhowee and other numerous upstream reservoirs before reaching the snail darter habitat.

Below Chilhowee, periodic heavy rains result in highly turbid water entering the river from tributaries (notably the Tellico River and Nine Mile Creek). This, again, is the result of agriculture. Water clarity, however, was usually high with light transmission in the range of 80-90 percent over the 53 km reach. Dissolved oxygen levels remained acceptable throughout the year ranging from 5 to 10 mg/l. Total hardness was very low, usually being 20 mg/l or less.

At the lower end of the "trout habitat", the Little Tennessee is joined by the Tellico River and remains characteristically a cold water environment having a temperature regime rarely higher than the optimal range for trout (maximum yearly temperature typically around 20°C). Stream gradient became somewhat less, but is high enough to keep the substrate relatively free of silt. The river in this reach became series of long pools (with sand and bedrock substrate) separated by shoals composed of sand, gravel, and rubble. Water depths varied according to discharge from Chilhowee, but under low discharge (approximately 50 m^3/sec), pools average 2-3 m and shoals 0.5-1.5 m in depth. The river is variable in width, but generally exceeds 100 m.

The benthic community in this reach was dominated by trichopterans, dipterans, and mollusca. Although 50 species of fish have been identified in the lower 31 km, only 11 (Table 1) can be considered to be permanent residents on the shoals frequented by snail darters. Piscivorous species such as Morone chrysops, Stizostedion canadense, and Hiodon tergisus are seasonally abundant but generally these potential snail darter predators are absent.

Distribution and Life History of Little Tennessee Population Prior to and After Impoundment

Table 1. Fish species collected from the lower 54-km stretch of the Little Tennessee River.

Petromyzonditae	Lampreys
Ichthyomyzon castaneus	Chestnut lamprey
Lampetra appendix	American brook lamprey
Clupeidae	Herrings
Dorosoma cepedianum	Gizzard shad
Hiodontidae	Mooneyes
Hiodon tergisus	Mooneye
Salmonidae	Trout
Salmo gairdneri	Rainbow trout
S. trutta	Brown trout
Cyprinidae	Minnows
Carassius auratus	Goldfish
Cyprinus carpio	Carp
Hybopsis aestivalis	Speckled chub
H. amblops	Bigeye chub
H. storeriana	Silver chub
**Nocomis micropogon*	River chub
Notropis atherinoides	Emerald shiner
N. chrysocephalus	Striped shiner
N. leuciodus	Tennessee shiner
N. spilopterus	Spotfin shiner
Phenacobius uranops	Stargazing minnow
Pimephales promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Catostomidae	Suckers
Carpiodes carpio	River carpsucker
C. cyprinus	Quillback
**Hypentelium nigricans*	Northern hog sucker
Ictiobus bubalus	Smallmouth buffalo
I. niger	Black buffalo
Moxostoma carinatum	River redhorse
M. duquesnei	Black redhorse
M. erythrurum	Golden redhorse
M. macrolepidotum	Shorthead redhorse
Ictaluridae	Freshwater catfishes
Ictalurus punctatus	Channel catfish
Pylodictis olivaris	Flathead catfish
Peociliidae	Livebearers
Gambusia affinis	Mosquitofish

Table 1. (continued)

Atherinidae	Silversides
Labidesthes sicculus	Brook silverside
Centrarchidae	Sunfishes
Lepomis auritus	Redbreast sunfish
L. cyanellus	Green sunfish
L. gulosus	Warmouth
L. macrochirus	Bluegill
Percidae	Perches
**Etheostoma blennioides*	Greenside darter
**E. rufilineatum*	Redline darter
**E. simoterum*	Tennessee snubnose darter
**E. zonale*	Banded darter
Perca flavescens	Yellow perch
**Percina caprodes*	Logperch
**P. evides*	Gilt darter
P. sciera	Dusky darter
**P. shumardi*	River darter
P. tanasi	Snail darter
Stizostedion canadense	Sauger
Percichthyidae	Temperate basses
Morone chrysops	White bass
Sciaenidae	Drums
Aplodinotus grunniens	Freshwater drum
Cottidae	Sculpins
**Cottus bairdi*	Mottled sculpin
**C. carolinae*	Banded sculpin

*Associated species

During 1974 and 1975, an intensive effort was made to determine the present range or the existence of any additional snail darter populations. A total of 43 watersheds were investigated including 120 specific sites. Although no other populations were located, several sites were surveyed as potential transplant locations.

Many of the basic aspects of the life history of the snail darter in the Little Tennessee River discussed in this section, were discovered after construction of the coffer dam at the Tellico Dam site in August, 1975. Following construction of these dams, a large area of the original river bed was pumped out to facilitate construction of the earthen portion of the dam. Biologists sampling in this area collected several snail darter specimens indicating that the species was not restricted to the relatively shallow shoal areas above the dam. Under normal river conditions, the coffer dam area had been four to six meters deep. This prompted further investigations in the remaining channel below the concrete structure and into the Tennessee River Embayment of Watts Bar Reservoir to determine actual distribution. Although snail darters were found as far downstream in the Tennessee River as 16 kilometers, the most important observation was the fact that large numbers of primarily young-of-the-year darters were found congregating in the area immediately below Tellico Dam. Concurrent with these observations, sampling in the river upstream throughout the late fall and early winter failed to produce any young darters. During the spring and summer, the situation persisted in the river while the fish below the dam had disappeared. In the fall of 1976, young-of-the-year snail darters again began accumulating below the dam while a declining population in the Little Tennessee was becoming apparent.

These observations enabled biologists to determine that, in addition to the potential impact from impoundment, there was a more immediate peril to the Little Tennessee population. The fish necessary to sustain the population were unable to pass upstream through the sluice gates of the dam to the shoals.

Aggregations of snail darters have been found on seven principal shoals in the lower 24 km of the river. Relative abundance varies seasonally and from shoal to shoal; however, largest concentrations occur over shoals at river miles 5.0 (8.0 km), 6.8 (10.9 km) (Coytee Spring), and 7.0 (11.3 km). Within these areas, the fish are most commonly associated with sand-gravel-small rubble substrate. As previously mentioned, beyond the shoal areas of the river, specimens have been collected in the Little Tennessee River embayment of Watts Bar Reservoir, as well as the upper 16 kilometers of the Tennessee River embayment of Watts Bar (Figure 1).

Fish of this species are relatively short-lived, apparently reaching a maximum age of five or possibly six years. During the first year, they grow to a mean total length of 48 mm and they reach 68 mm at the end of the second year. Thereafter, growth slows considerably. The largest specimen ever recorded was 89 mm.

Although observations of spawning behavior have not been confirmed, the congregation of males and females on specific shoals strongly suggests the time and place of spawning. About one-fourth of the population reaches sexual maturity during the first year; all are mature during their second year. Ripe individual fish (primarily males) begin showing up on the shoals [river miles 5.0 (8.0 km), 6.8 (10.9 km), and 7.0 (11.3 km)] as early as November; however, the large concentrations are not evident until middle to

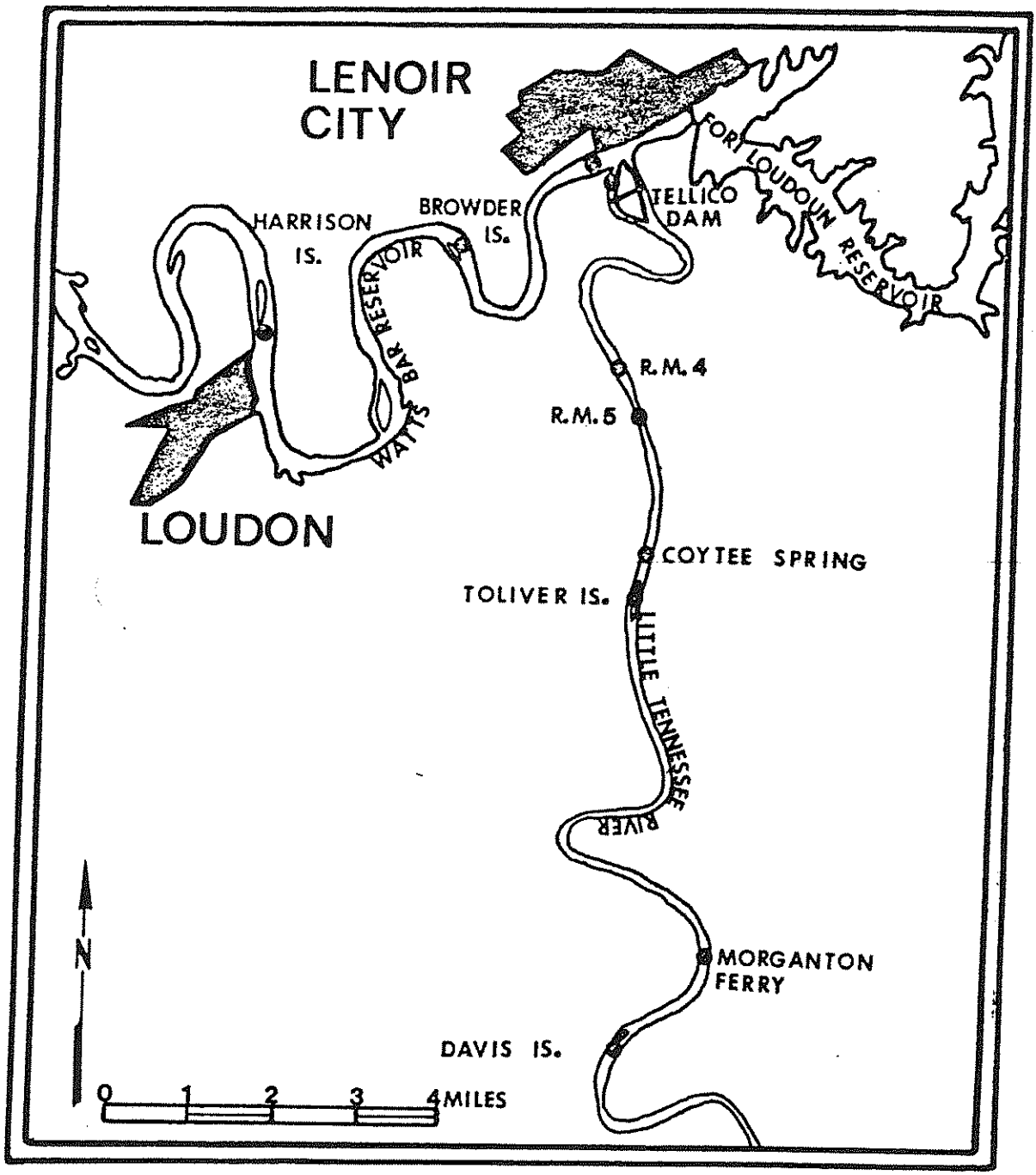

Figure 1. Known snail darter concentrations in the Little Tennessee River and the Tennessee River portion of upper Watts Bar Reservoir.

late January. Through mid-March, both ripe and spent fish can be collected with increasing proportions of the latter.

Eggs are deposited in the gravel or on rocks, and after a period of 15-20 days, hatching occurs. Once hatched, the larvae drift with the current out of the Little Tennessee River into the upper end of Watts Bar Reservoir of the Tennessee River. For the next five to seven months, the fish spent their nursery period in the main stream of the Tennessee River presumably feeding on zooplankton. After reaching a total length of 30-40 mm, the juvenile darters begin to migrate back to the shoal areas in the Little Tennessee River where they spend the remainder of their lives.

In contrast to many other species of darters, the snail darter exhibits no particular territorial behavior. Adults have been observed in small groups, and young fish have been seen in aggregations of 50 or more, with no aggressive behavior noted.

As its name suggests, snails comprise the primary food items in the snail darter's diet. Although their diet varies seasonally, snails comprise about 60 percent of their annual consumption represented almost entirely by Anculosa and Physa. Of secondary importance are trichoperans (Brachycentrus, Hydropsyche, and Glossosma) and the dipteran, Simulium.

Snail Darter Transplants and Their Status

Prior to the discovery of additional populations, the main emphasis of the snail darter recovery effort was on transplants.

From June 1975, through February 1976, TVA transplanted a total of 710 snail darters to the Hiwassee River in southeastern Tennessee. The Hiwassee was selected as a result of the range examinations and its similarity to the Little Tennessee River. This activity, conducted under permit from the

State of Tennessee and the U.S. Department of the Interior, was designed to enhance the probability that the species would continue to exist even if its habitat was eliminated in the Little Tennessee. Since the transplant into the Hiwassee River, natural reproduction has been documented for seven successive years, the population range has expanded over 11 kilometers of river (distributed over 2 km originally), and population abundance estimates indicate that at least 2,500 snail darters were in the river in 1979 and an estimate of the total population on September 1981 was about 3,000 fish. On the basis of these and other biological observations, it would appear that the species has become established.

In October 1975, 61 snail darters were transplanted into the Nolichucky River at river mile 18 (28.8 km). However, efforts to establish the darter there were discontinued in the Nolichucky when the sharphead darter, another rare species, was discovered there. Biologists felt that introduction of the snail darter might jeopardize the sharphead darter.

During a mussel survey on the Nolichucky River in June 1980, a snail darter (60-65 mm total length) was observed at Nolichucky river mile 11.4 (18.2 km). However, subsequent intensive searches of shoal areas from NRM 7.5 (12.1 km) to 15.2 (24.5 km) failed to locate any additional snail darters.

There are two possible explanations for the snail darter sighting in the Nolichucky River. Although no additional snail darters were discovered, a small reproducing population too widespread to be easily detected, may exist. Secondly, the snail darter observed could have escaped from the Morristown State Hatchery which is located on a small tributary to the Nolichucky River. At the time of the sighting snail darters were being held at the hatchery which is about 5.5 stream miles (8.8 km) above NRM 11.4

(18.2 km). The final snail darter count at the hatchery revealed 17 individuals unaccounted for.

The Holston River [HRM 14.4 (23 km)] was stocked with 533 snail darters from late 1978 through 1979. Some of these fish came from the Hiwassee (104) while the rest were taken from the Little Tennessee River. The Holston River was determined by the team to be the next best transplant site after the Hiwassee River within the species' probable historic range. The present status of these fish is unknown. Initial monitoring resulted in low abundance estimates indicating either poor survival or a wide dispersion of those released individuals. However, as individuals observed during monitoring were in excellent conditions, wide dispersion is expected. The area was last surveyed in 1980. No signs of reproduction have ever been observed.

The Elk River at ERM 41.0 (65.9 km) was stocked with 425 snail darters on July 21, 1980. These fish had been salvaged from the Little Tennessee River during the fall of 1979. The river was searched the first spawning season after introduction. The fish from the original transplant were encountered but no reproduction could be documented. A large percentage of the darters transplanted into the Elk were young-of-the-year fish so spawning may not occur until 1983.

Present Distribution and Status

The Tennessee River at Watts Bar Reservoir, Loudon County, Tennessee

Snail darters were discovered in Watts Bar Reservoir in December 1979 and have been observed on numerous occasions since that time (Table 2). However, it is not known if these fish represent a reproducing population or

TABLE 2

CHRONOLOGY OF SNAIL DARTER SEARCHES
IN RIVERS WHERE SPECIES WERE STOCKED AND WHERE NEW
POPULATIONS WERE FOUND [Male (M), Female (F)]

RECENT SNAIL DARTER SURVEYS AND DARTER LOCATIONS

Survey Date	Survey Location	Result of Survey
	Nolichucky River	
11/04/76	NRM 17.8	None found
06/13/80	NRM 11.4	1 observed
09/04/80	NRM 7.5 - 14.0	None found
	Holston River	
12/28/79-10/31/79	HRM 14.4	Introduced 533
08/12/80	HRM 14.4	3 observed
09/29/81	HRM 14.4	1 observed
10/01/81	HRM 14.4	None found
	Watts Bar Reservoir (Since Tellico Dam Closure 11/29/79)	
12/04/79	Below Tellico Dam	21 snail darters*
12/05/79	Below Tellico Dam	51 snail darters*
12/07/79	Below Tellico Dam	30 snail darters*
12/10/79	Below Tellico Dam	50 snail darters*
12/11/79	Below Tellico Dam	11 snail darters*
01/10/80	Below Tellico Dam	7 snail darters*
03/13/80	TRM 597.2	9 observed, 7 collected, 48-63 mm range
09/29/80	TRM 601.0	8 collected, 46-68 mm range
11/21/80	TRM 601.0	13 observed, 2 captured, 47 and 75 mm
10/27/81	TRM 601.0 & 597.2	None found
11/24/81	TRM 601.0	None found
04/23/82	TRM 597.2	6 observed, 2 captured, 77 and 76 mm - (F)
05/27/82	TRM 597.2	8 observed, 1 captured, 67 mm - (M)
09/12/82	TRM 597.2	3 observed

*Collected for transplant activities.

Sewee Creek

04/02/81	SCM 4.2	29 collected, 42-52 mm
04/03/81	SCM 3.5	10 collected, 44-49 mm
04/03/81	SCM 11.0 - 5.7	None found
04/09/81	SCM 3.5 - 3.2	75 collected, 41-67 mm
06/19/81	SCM 5.7	15 collected, 42-61 mm
06/19/81	SCM 4.1	3 collected
08/18/81	SCM 4.2 & 5.7	19 collected, 45-64 mm
08/17-18/81	SCM 3.5, 4.5, & 5.5	Population transects found fish at all sites
08/19/81	TRM 520-521 (scuba)	None found
09/18/81	SCM 3.2	18 collected, 45-64 mm
09/18/81	SCM 5.7	None found

Chickamauga Reservoir

04/03/76	TRM 529-528	None found
04/19/76	TRM 515.4	2 fish observed
04/76-05/76	TRM 515.4, 520-521	None found (Multiple scuba diving attempts to re-locate 04/19/76 find, at least 20 days)
04/27-28/76	TRM 524.8	None found
05/17/76	TRM 524.8	None found
08/19/81	TRM 524.8	None found

Hiwassee River

1976-1981 Quarterly Sampling	HRM 31-38 @ usually 6 sites	Always found at all sites
04/22/76	TRM 469.5-470.7	None found
04/23/76	TRM 464.6-465.7	None found

Nickajack Reservoir

03/31/81	TRM 468.5	None found
04/01/81	TRM 468.5	4 observed, 1 captured, 50mm

South Chickamauga Creek

11/01/80	SCCM 12.6	6 collected-initial find
11/06/80	SCCM 12.2, 12.6, 12.8	14 collected, 52-67mm
11/07/80	SCCM 12.6	9 collected, 52-72mm
11/10/80	SCCM 8.3	2 collected, 63 & 65 mm
11/11/80	SCCM 5.9, 7.3	7 collected, 55-72mm
11/12/80	SCCM 19.3	1 collected, 48 mm
11/13/80	SCCM 19.1	3 collected, 47 & 48 mm
11/14/80	SCCM 17.7 & 18.0	2 collected, 47 mm
06/18/81	SCCM 12.6	3 collected, 65 mm (M)
08/20/81	SCCM 5.0 & 12.6	None found
11/04/81	SCCM 12.6	14 collected, 69-74mm
11/04/81	SCCM 19.3	None found
11/05/81	SCCM 5.0	None found
04/05/82	SCCM 12.6	2 specimens chosen from several collected

Guntersville Reservoir

04/07/81	TRM 422.9	1 observed
04/08/81	TRM 422.9	1 observed

Sequatchie River

03/28/81	SRM 8.3	1 collected-initial find
04/22/81	SRM 9.3	3 collected, 48-55mm
06/18/81	SRM 9.5	None found
08/25/81	SRM 9.7	2 collected, 54 & 56mm (F)
08/26/81	SRM 13.0	2 collected, 56 & 60mm (F)
08/26/81	SRM 17.0	4 collected, 55-61mm

Paint Rock River

09/09/81	PRRM 15,8	1 collected, 49mm initial find
09/10/81	PRRM 15.2-5.0	None found
09/22/81	PRRM 24.5-21	None found
09/23/81	PRRM 16.9	1 collected, 48 mm
09/23/81	PRRM 19.3	3 collected, 47-60mm

Elk River

07/21/80	ERM 41.0	Introduced 425 51-84 mm
10/07/80	ERM 41.0	6 collected, 64-70mm
08/10/81	ERM 41.0	None found
10/19/81	ERM 41.0	4 collected, 73-77mm
10/20/81	ERM 26.5-31.0	None found

are remnants of the population from the Little Tennessee River which enters the upper end of the Reservoir.

Scuba dives have been conducted in Watts Bar Reservoir since the closure of Tellico Dam in an attempt to determine if a self sustaining population existed here. Although snail darters have been observed, no individuals young enough to have been spawned since the flooding of the Little Tennessee have been sighted. Verification of reproduction in this Tennessee River Reservoir would indicate that the species likely spawns in other Tennessee River Reservoirs and that its future is probably secure.

If a population exists here it could be threatened by a port facility proposed for TRM 592.5 (953.5 km) and TRM 600.2 (965.9 km). The Little Tennessee River previously entered the reservoir at TRM 601.1 (967.3 km).

Sewee Creek, Meigs County, Tennessee Snail darters were first discovered in Sewee Creek on April 2, 1981, when 29 darters of the 1980 year class were collected. Sampling since that time has been limited (Table 2), but it has indicated four year classes co-existing in the creek with the 1980 year class predominating. Snail darters are found upstream to creek mile 5.7 (9.1 km) where a small waterfall appears to block upstream migration.

Snail darter density measurements were made in August 1981 at three areas in the creek. A concentration of 1.44 snail darters per 100 square meters was calculated. This figure is nearly identical to the concentrations reported for the Coytee Springs/Tolliver Island area of the Little Tennessee River in the winter of 1976. A September 10, 1981, abundance survey in Hiwassee River estimated a density of 1.28 per 100 square meters. This figure likely would have been larger if the two best shoal areas of the Hiwassee had been sampled.

No Sewee Creek population size estimates can be made as the extent of the preferred habitat in Sewee Creek is unknown. However, the population appears healthy but likely smaller than the Hiwassee due to the small stream size [generally less than 50 feet (14.9 m) wide] and short stream reach inhabited by the snail darters in Sewee Creek.

Sewee Creek's habitat is probably one of the most secure of the five known tributaries containing snail darters. The watershed is small, mostly rural and forested. Human population in the county containing most of the Sewee creek watershed was estimated at 7,431 in 1980 and was expected to rise to only 8,755 by 1990 (personal communication with Ms. Pamela Taylor, Tennessee Department of Economic and Community Development).

Hiwassee River, Polk County, Tennessee This is the most studied of all the presently known populations, having been surveyed quarterly from 1976 through 1981 (Table 2). Reproduction has been documented by the presence of young-of-year fish for every year from 1976 through 1982 and increasing rates of recruitment and total population numbers have been observed.

The Hiwassee River population was estimated at 2,659 fish on four of the six regularly surveyed shoals in September 1981. As two of the shoals were not sampled, the true population is likely 3,000 or more. Excellent growth rates, body condition, maximum size of individual darters and increase in recruitment suggests that continued growth in this population can be expected.

Although all biological signs are favorable for this population, two principal factors exist in the watershed which may adversely impact the population in the future.

Numerous train derailments have occurred on a railroad which parallels the Hiwassee in the area upstream of the snail darter population. The

principal user of the rail transports Oleum and sulfuric acid from a plant in Copper Hill, Tennessee. To reduce the chance of accidents and respond quickly to acid spills the railroad has been upgraded with new rails, ties have been replaced, speed limits reduced and lime to neutralize any acid spills is stored at two locations along the river (personal communication with railroad and local industrial representatives). These factors, along with reduced traffic due to a one-third cutback in plant production, offers an increased margin of safety for the snail darter population.

Heavy metal and pH problems in the Ocoee River, a tributary to the Hiwassee, also represents a potential threat to the population. However, waste water cleanup and reforestation programs have been implemented and these activities should continue to help to alleviate this condition.

South Chickamauga Creek, Hamilton County, Tennessee and Catoosa County, Georgia Snail darters were found in South Chickamauga Creek on November 1, 1980, and subsequent sampling verified the species at ten sites from creek mile 19.4 (31.0 km) to the backwaters of Nickajack Reservoir (Table 2).

This discovery of snail darters in this creek was a surprise, not only because it was the first find of a naturally occurring population other than the Little Tennessee River, but because of the creek's small size and the water quality history of South Chickamauga Creek. This stream receives industrial effluents, sewage plant discharges and urban runoff[1] and the

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1. Tennessee Department of Public Health, 1978, Water Quality Management for Lower Tennessee River Basin (State 208 plan), Division of Water Quality Control. Nov. 1978. 183pp.

lower creek underwent a major channelization project in 1977. The creek has also been subjected to several fish kills from truck accidents.

Some sampling trips to the creek have proven very successful while others yielded only a few or no snail darters. On June 18, 1981, a sample at creek mile 12.6 (20.2 km) yielded only three snail darters with great difficulty. On August 20, 1982, none could be located at either creek mile 5.0 (8.0 km) or 12.8 (20.5 km). However, on November 4, 1981, fourteen individuals were collected at creek mile 12.6 (20.2 km) without extreme effort and on April 5, 1982, similar snail darter densities were again encountered at the same site.

This population has somehow been able to maintain itself in spite of water quality and habitat degradation problems in the past. Although the future for stream quality looks better in some respects (upgrading of sewage treatment facilities, stricter environmental enforcement, etc.) the human population of the watershed is large (287,740 in 1980) and is expected to increase by 20,000 by 1990 (personal communication with Ms. Pamela Taylor, Tennessee Department of Economic and Community Development). This increase is anticipated to be accompanied by a projected increase in industrial uses in the lower creek.[2] Increased development heightens the problems associated with urban runoff and accidental spills of toxic chemicals. To

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2. U.S. Corps of Engineers 1975. Final Environmental Impact Statement. Open Channel Maintenance, Tennessee River and Tributaries in Kentucky, Tennessee, Mississippi, Alabama, and Georgia. Atlas, Vol. II, July 1975, 77pp.

secure the future of this population, the water and habitat quality of the stream must be considered in future development plans.

Tennessee River, Nickajack Reservoir, Hamilton County, Tennessee

After the discovery of the snail darter population in South Chickamauga Creek in November 1980, a limited search of Nickajack Reservoir near the mouth of South Chickamauga Creek was made. Four snail darters were observed. Whether this represents a resident population in the reservoir or part of the South Chickamauga Creek population cannot be determined based on this limited data.

There are two projects presently under consideration which could impact snail darters in the reservoir. A commercial dredging operation is proposed for TRM 453-460 (788.9-740 km) and a port facility is proposed for TRM 466-468 (749.9-753.5 km). The snail darters were found in the area of TRM 468.2 (753.5 km).

Sequatchie River, Marion County, Tennessee

This population was discovered in March 1981, and has been sampled five times since. As can be seen in Table 2, only 12 snail darters have been collected from the river and this was with considerable effort. The only site where there appeared to be a concentration of snail darters was at river mile 17.0 (27.4 km), just below a mill dam which apparently blocked their upstream migration. Here, a small quantitative sample was taken and revealed 1.15 individuals per 100 square meters.

The Sequatchie valley is a rural valley and little human population growth is expected (personal communication with Ms. Pamela Taylor, Tennessee Department of Economic and Community Development). However, the valley does contain coal reserves and coal mine activities have brought siltation and pH

problems to the tributaries.[3] Of special concern is the Little Sequatchie River which enters the Sequatchie at SRM 8 (12.8 km). This stream has experienced fish kills which have been partially attributed to coal mining.

Tennessee River, Guntersville Reservoir, Marion County, Tennessee

Two snail darters were observed by scuba divers in Guntersville Reservoir just upstream of the mouth of the Sequatchie River. One individual was an adult male and the other was estimated to be about 60 mm and assumed to be an adult. It is not known if these represent a resident population in the main Tennessee River or if they are a part of the Sequatchie River population.

Snail darters in the reservoir could be impacted by a proposed dredging operation at TRM 390.3-423 (628-680.7 km) and a proposed port facility development at TRM 424 (682 km). The sequatchie River enters the Tennessee River at TRM 422.7 (680.2 km).

Paint Rock River, Jackson and Madison Counties, Alabama

The snail darter population was found in this river in September 1981, after extensive searches. A total of four days of sampling yielded only five snail darters. Two of the fish were taken in one seine haul and three of the fish were taken from one shoal (Table 2). Four of the individuals were young-of-the-year fish while one was a 60 mm female presumed to be from the 1980 year class.

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3. Tennessee Department of Public Health p. 23

This population appears very limited but without further data no conclusions can be made.

The Paint Rock River valley is forested in the upper basin with row crops predominating along the river in the downstream sections. Stream siltation and enrichment problems associated with agricultural activities are evident and pesticides may be a threat in the lower basin. These problems may be lessened in the future as improved farming techniques and pesticide applications are implemented (personal communication with Mr. Sammy K. Harris, U.S. Soil Conservation Service). The Paint Rock was channelized by the U.S. Army Corps of Engineers in 1966 (Personal communication with Mr. E. C. Moore, U.S. Army Corps of Engineers). Presently there is some discussion in the valley that the river banks may be debrushed and gravel bars removed to eliminate flood threats. These activities could threaten this snail darter population.

PART II

RECOVERY

A. Recovery Objectives: The ultimate goal of this Recovery Plan is to protect and recover the snail darter (Percina tanasi) to the point where it can be removed from the Federal List of Endangered and Threatened Species. The species shall be considered recovered when one of the alternatives (A, B, or C) listed below is met and no present or foreseeable threats exist which could cause the species to become in danger of extinction throughout a significant portion of its range.

The Snail Darter Recovery Team has reviewed the present status of the species. They beleive the species could be reclassified to Threatened status.

Alternative A:

Suitable habitat areas of the Tennessee River within the area from the backwaters of Wheeler Reservoir upstream to the headwaters of Watts Bar Reservoir are inhabited by snail darter populations which can survive and reproduce independently of tributary rivers as evidenced by documented reproduction in Watts Bar Reservoir or some other Tennessee River reservoir.

Alternative B:

More Tennessee River tributary populations of the species are discovered and existing populations are not lost. The number of additional populations needed to meet this criteria would vary depending on the status of the new populations, but two populations similar to the Sewee Creek, South Chickamauga Creek, or Sequatchie River populations or one comparable to the Hiwassee River population would denote recovery.

Alternative C:

Through maintenance of existing populations and/or by expansion of these populations, there exist viable populations* of snail darters in five separate streams such as Sewee Creek, Hiwassee River, South Chickamauga Creek, Sequatchie River, and Paint Rock River.

*Viable populations - Population monitoring over a ten-year period (biannual sampling) indicates that the snail darter is reproducing (at least two year classes present each year sampled) and that the population is either stable or expanding. For some populations, existing data may be used to meet this requirement.

B. Stepdown Outline

1. Preserve presently known snail darter populations by insuring agencies utilize existing legislation and regulations (Federal and state endangered species law, water quality requirements, stream alteration regulations, etc.) to protect the species and its habitat.

2. Determine the distribution and status of the snail darter in the main stem Tennessee River from Wheeler Reservoir to Watts Bar Reservoir.

3. Search for other tributary populations; if found, evaluate status.

NOTE: Recovery tasks 4. through 7. are aimed at meeting recovery alternative C. If either alternative A or B is satisfied, most of these activities will not need to be funded.

4. Determine present and foreseeable threats to the snail darter populations and strive to minimize and/or eliminate the threats where necessary to meet the recovery objectives.

4.1 Investigate and inventory factors negatively impacting the species and its environment.

4.2 Solicit information on proposed and planned projects that may impact the species.

4.3 Determine measures that are needed to minimize and/or eliminate any adverse impacts and implement where necessary to meet recovery objectives.

4.4 Solicit help in protecting the species and its essential habitat.

4.4.1 Meet with local government officials and regional and local planners to inform them of our plans to attempt recovery and request their support.

4.4.2 Work with local, state, and Federal agencies to encourage them to utilize their authorities to protect the species and its river habitat.

4.4.3 Meet with local business and industry interests to elicit their support in implementing protective measures.

4.4.4 Meet with landowners adjacent to the rivers and inform them of the recovery effort and try to get their support and habitat protection measures.

4.4.5 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, boy scouts, church organizations, etc. Educational material outlining the goals of the recovery action with emphasis on the other benefits of maintaining and upgrading habitat quality may be needed to help inform the public of our actions.

5. Conduct population and habitat surveys of known populations.

5.1 Determine the status of the five tributary populations.

5.2 Characterize the habitat and ecological associations and determine essential elements (biotic and abiotic factors) of the species' habitat on a need to know basis.

5.3 Determine the extent of the species' preferred habitat and present this information in a manner which identifies specific areas in need of special attention.

6. Investigate the need for habitat improvements over and above those actions needed to modify or eliminate those negative factors outlined in 4.3; and, if feasible and necessary to attain recovery, develop techniques and sites for habitat improvement and implement.

7. Develop and implement a program to monitor the species' population levels and habitat quality.

8. Once the plan is implemented, annually assess overall success of the recovery program and recommend action (change in recovery objectives, delisting, continued protection, implementation of new measures, other studies, etc.).

C. Narrative Outline

1. Preserve presently known snail darter populations by continuing to utilize existing legislation and regulations (Federal and state endangered species law, water quality requirements, stream alteration regulations, etc.) to protect the species and its habitat. Unless the main stem Tennessee River is found to contain populations which can survive and reproduce without tributary rivers or other tributary populations are found, the protection of the five known Tennessee River tributary populations is crucial to recovery.

The state agencies in Alabama, Georgia, and Tennessee; the U.S. Fish and Wildlife Service, the Tennessee Valley Authority, and other Federal agencies, through the enforcement of existing laws and regulations, provide substantial protection to the species.

This protection must continue if the species is to be preserved and eventually recovered.

2. Determine the distribution and status of the snail darter in the main stem Tennessee River from Wheeler Reservoir to Watts Bar Reservoir. Snail darters have been observed in the Tennessee River near the mouths of some of the tributaries inhabited by the species. If the Tennessee River is the species' principal habitat and the tributaries are not required for the completion of the fishes' life cycle, the snail darter's future is relatively secure and the species could be delisted.

In an attempt to confirm the existence of a reproducing Tennessee River snail darter population, the Fish and Wildlife Service funded a 1982 scuba search for juvenile darters immediately below Fort Loudoun Reservoir. The species was encountered, but based on the age of the individuals, they could have been spawned in the Little Tennessee River prior to closure of Tellico Dam.

Further studies will be needed to determine if these individuals represent a reproducing population. There are no Tennessee River tributaries in the vicinity which are known to harbor the species. Thus, by 1985, any snail darters found in the Tennessee River below Fort Loudoun Reservoir can be assumed to be from a Tennessee River population.

3. Search for other tributary populations; if found, evaluate status. Searches for other snail darter populations have been conducted in the Flint River, Cypress Creek, and Indian Creek with no success. The Holston River and Elk River have been stocked with snail darters. However, surveys to date have not indicated any reproduction. Considering the difficulty in collecting the snail darter in waters with low populations (four days of searches in the Paint Rock yielded five snail darters), the potential exists that the species may exist in these or other waters.

NOTE: Recovery tasks 4. through 7. are aimed at meeting recovery alternative C. If either alternative A or B is satisfied, most of these activities will not be needed.

4. Determine present and foreseeable threats to the snail darter populations and strive to minimize and/or eliminate the threats where necessary to meet the recovery objectives. Each area inhabited by the species is subject to environmental stresses which negatively affect the species and its habitat. The impact of these and other foreseeable threats must be studied to determine if they are severe enough to interfere with recovery. Some impacts may require modification or elimination before recovery can be met.

4.1 Investigate and inventory factors negatively impacting the species and its environment. Threats to each population must be assessed. Some of these threats may be obvious. However,

other factors may require research into the species' habitat needs and ecological associations before the extent of their negative impact can be determined. (See Narrative point 5.2)

4.2 Solicit information on proposed and planned projects that may impact the species. If the species is to be delisted, the Service must be assured that there are no planned or proposed projects that could likely jeopardize the continued existence of the species.

4.3 Determine measures that are needed to minimize and/or eliminate any adverse impacts and implement where necessary to meet recovery objectives.

4.4 Solicit help in protecting the species and its essential habitat. Section 7 consultation under the Endangered Species Act and Fish and Wildlife coordination Act activities can assist in protecting these populations, but the Fish and Wildlife Service will not be able to recover the species alone. The assistance of other Federal agencies, as well as state and local governments, will be essential. Support from the local industrial and business community as well as the general public will also be needed to preserve habitat quality and recover the species. Without a commitment from the people in these stream valleys who have an influence on habitat quality, the recovery effort will be ineffective.

4.4.1 Meet with local government officials and regional and local planners to inform them of our plans to attempt recovery and request their support.

4.4.2 Work with local, state, and Federal agencies to encourage them to utilize their authorities to protect the species and its river habitat.

4.4.3 Meet with local business and industry interests to elicit their support in implementing protective measures.

4.4.4 Meet with landowners adjacent to the rivers and inform them of the recovery effort and try to get their support and habitat protection measures.

4.4.5 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, boy scouts, church organizations, etc. Educational material outlining the goals of the recovery action with emphasis on the other benefits of maintaining and upgrading habitat quality may be needed to help inform the public of our actions.

5. Conduct population and habitat surveys of known populations.

5.1 Determine the status of the five tributary populations. Very little is known about the long-term trends of four of the five tributary populations. The Hiwassee population has expanded since introduction; however, recent data is lacking. The Sequatchie River and South Chickamauga Creek populations appear small, while the Paint Rock River population seems extremely small and limited. The health of these populations (increasing, stable, or decreasing) and relative size of the populations must be assessed if alternative C is the required recovery objective.

5.2 Characterize the habitat and ecological associations and determine essential elements (biotic and abiotic factors) of the species' habitat on a need to know basis. Considerable knowledge concerning the life history and habitat association is known for the Little Tennessee River and Hiwassee River populations. However, specific information such as an understanding of its spawning cycle will likely be needed to enable the recovery programs to focus management and protection efforts on the newly discovered populations. These studies will be conducted on a need-to-know basis.

5.3 Determine the extent of the species' preferred habitat and present this information in a manner which identifies specific areas in need of special attention. As knowledge of the preferred habitat is gathered, this information should be utilized to delineate specific habitat areas within each

stream that needs special attention. The use of maps pinpointing areas of special concern will allow planners to avoid these sensitive sites.

6. Investigate the need for habitat improvements over and above those actions needed to modify or eliminate those negative factors outlined in 4.3; and, if feasible and necessary to attain recovery, develop techniques and sites for habitat improvement and implement. Specific components in the snail darter's habitat may be lacking, and these deficiencies may limit potential expansion and recovery of the species. Habitat improvement programs and activities may be required to counter these limiting factors. This may be particularly true in those streams where the species exists in low numbers.

7. Develop and implement a program to monitor the species' population levels and habitat quality. In order to assess the recovery objectives, the status of the species and its habitat must be monitored. This will likely require a survey of known populations every other year during the recovery phase of the plan.

8. Once the plan is implemented, annually assess overall success of the recovery program and recommend action (change in recovery objectives, delisting, continued protection, implementation of new measures, other studies, etc.). FWS policy requires that recovery plans must be evaluated periodically to determine if it is on track and to recommend future actions. As the plan is implemented

and more is learned about the species, the recovery objectives and other aspects of the plan may need modification.

PART III.

IMPLEMENTATION SCHEDULE

Priorities within this section (Column 4) have been assigned according to the following:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Snail Darter Recovery Plan
Part III Implementation Schedule

*1 General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			*3 Estimated Fiscal Year Costs			Comments/Notes
					FWS		*2				
					Region	Program	Other	FY 1	FY 2	FY 3	
01, 04	Continue to utilize existing legislation and regulations to protect the species and its habitat	1.	2	Continuous	4	Endangered Species (SE) and Ecological Services (ES)	Alabama DCNR, Georgia DNR, Tennessee WRA, and TVA	1,000	1,000	1,000	*1. See attachment: General Categories for Implementation Schedules *2. Other agencies' responsibility would be of a cooperative nature or projects funded under a contract or grant program. In some cases contracts could be let to universities or private enterprises. *3. NOTE: ALL ESTIMATES ARE FOR FWS FUNDS ONLY.
I1	Determine distribution and status in main stem Tennessee River	2.	3	2 years	4	SE	Same as above and contract	7,500	7,500	--	If either Task 2. or Task 3. yielded positive results, many of the other Tasks outlined here would be unnecessary.
I1	Search for other tributary populations	3.	3	2 years	4	SE	Same as above and contract	5,000	5,000	--	
I2, I12 I14	Inventory present negative impacts on species.	4.1	3	1 year	4	SE	Same as above and contract	--	5,000	--	Task 4.1 and 4.2 would likely be done under the same contract or done in house.
I12, I14	Inventory proposed and planned projects that may impact species.	4.2	3	1 year	4	SE	Same as above and contract	--	5,000	--	

Snail Darter Recovery Plan
Part III Implementation Schedule

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS Region	Program	Other	FY 1	FY 2	FY 3	
M7, O3, O4	Determine measures to minimize and/or eliminate adverse impacts and implement	4.3	3	Unknown	4	SE	Same as above and contract	--	Unknown	--	
O1	Request support from local governments and regional planners.	4.4.1	3	Continual	4	SE	Same as above	--	1,000	1,000	Tasks 4.4.1 - 4.4.5 must be coordinated closely with state wildlife agencies. They, in most cases, have good contacts in the local communities and with other state and local agencies.
O1, O2 O3	Encourage full utilization of all existing environmental regulations--local, state, and Federal.	4.4.2	3	Continual	4	SE and ES	Same as above	--	1,000	1,000	
O1	Request support from local business and industry groups.	4.4.3	3	Continual	4	SE and ES	Same as above	--	1,000	1,000	
A3, O1	Request support and maintain rapport with landowners.	4.4.4	3	Continual	4	SE	Same as above	--	1,000	1,000	
O1	Develop and utilize an information and education program (slide/tape shows, brochures, etc.) for local distribution	4.4.5	3	1 year for development; continual for implementation	4	SE and ES	Same as above	--	5,000 for development	1,000 for implementation	
I1, I2	Determine status of the five tributary populations.	5.1	3	2 years	4	SE	Same as above and contract	--	10,000	10,000	Task 5.1 - 5.3 would likely be done under the same contract or done in house.

Snail Darter Recovery Plan
Part III Implementation Schedule

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS						
					Region	Program	Other	FY 1	FY 2	FY 3	
I3	Characterize habitat and ecological associations	5.2	3	2 years	4	SE	Same as above and contract	--	--	Unknown	This will be done on a specific need-to-know basis.
I3	Determine and delineate the extent of species' preferred habitat.	5.3	3	1 year	4	SE	Same as above and contract	--	--	5,000	
M3	Investigate need for habitat improvement and implement where needed.	6	3	Unknown	4	SE	Same as above and contract.	--	--	Unknown	Possibly for FY 85 or later.
I1, I2	Develop and implement a program to monitor species' population level and habitat quality.	7	3	Unknown	4	SE	Same as above and contract	--	--	5,000	This task would likely be be implemented the year after the status of the five tributary populations is established.
O4	Annual assessment of recovery program and modify where needed.	8	3	Continual	4	SE	Same as above	500	500	500	

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.

IV. APPENDIX

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