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Recovery Outline

for

Cumberland darter (*Etheostoma susanae*)

August 2011

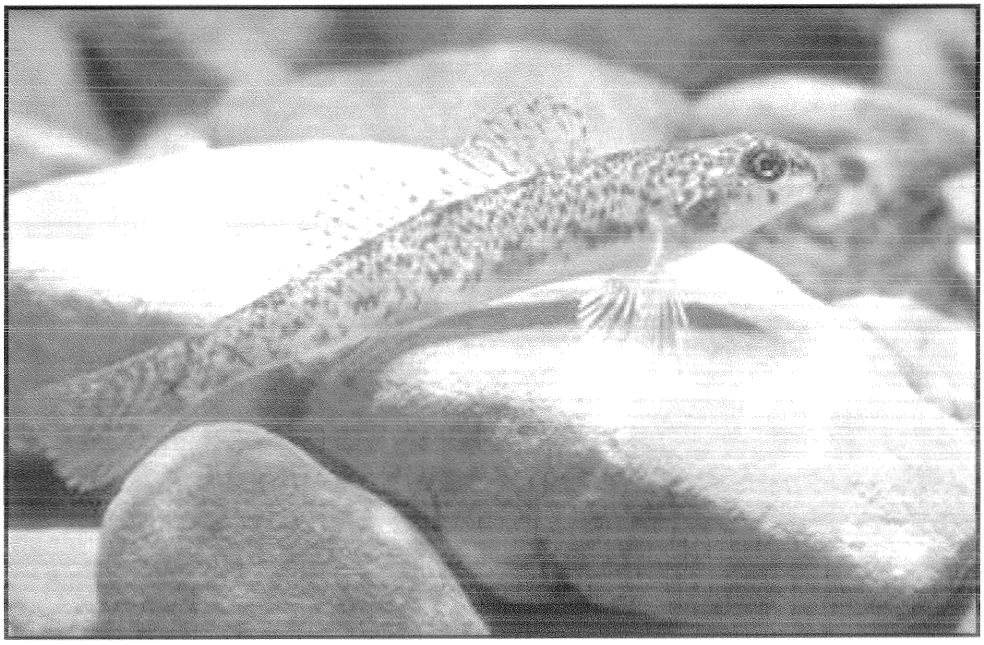

Photo courtesy of J. R. Shute, Conservation Fisheries, Inc.

I. INTRODUCTION

This document outlines a preliminary course of action for the recovery of the Cumberland darter (*Etheostoma susanae*) until a comprehensive recovery plan for the species is approved. The Cumberland darter is a small freshwater fish that occupies pools and shallow runs of low- to moderate-gradient streams with stable sand and sand-covered bedrock substrates. The Cumberland darter currently occupies 13 streams in the upper Cumberland River basin in Kentucky and Tennessee. The final rule listing the Cumberland darter as an endangered species was published on August 9, 2011 (76 FR 48722). The primary threat to the Cumberland darter is modification and curtailment of its habitat and range due to a variety of human-induced impacts such as siltation, water quality degradation, disturbance of riparian corridors, and changes in channel morphology. The species' small, isolated populations also make it vulnerable to natural and human induced catastrophic events (e.g., droughts, resource extraction, pollution spills, etc.) and to reduced fitness caused by low genetic diversity.

Listing and Contact Information:

Listing Classification:	Endangered range wide
Effective Listing Date:	September 8, 2011
Critical Habitat Designation:	TBD
Lead Agency, Region:	U.S. Fish and Wildlife Service, Southeast Region
Lead Field Office:	Kentucky Ecological Services Field Office (KFO)
Contact Biologist:	Dr. Michael A. Floyd, 502-695-0468, x102, mike_floyd@fws.gov
Cooperating Office:	Tennessee Ecological Services Field Office

II. RECOVERY STATUS ASSESSMENT

A. BIOLOGICAL ASSESSMENT

Taxonomy, Life History, Habitat, Distribution, and Trends

Taxonomy: The Cumberland darter, *Etheostoma (Boleosoma) susanae* (Jordan and Swain), was first described as *Boleosoma susanae* by Jordan and Swain (1883, pp. 249–250) from tributaries of the Clear Fork of the Cumberland River, Kentucky. Subsequent studies by Kuhne (1939, p. 92) and Cole (1967, p. 29) recognized the taxon as a subspecies (*Etheostoma nigrum susanae*) of *E. n. nigrum* (Johnny darter). Starnes and Starnes (1979, p. 427) clarified the subspecific status of the Cumberland darter, differentiating it from the Johnny darter by several diagnostic characteristics. Strange (1998, p. 101) elevated *E. n. susanae* to full species status based on analyses of mitochondrial DNA for *E. n. susanae* and *E. n. nigrum*.

Description, Habitat, and Life History: The Cumberland darter is a medium-sized member of the fish tribe Etheostomatini (family Percidae) that reaches over 5.5 centimeters (cm) (2 inches (in)) standard length (SL) (length from tip of snout to start of the caudal peduncle (slender region extending from behind the anal fin to the base of the caudal fin)) (Etnier and Starnes 1993, p. 512). The species has a straw-yellow background body color with brown markings that form six evenly spaced dorsal (back) saddles and a series of X-, C-, or W-shaped markings on its sides (Etnier and Starnes 1993, p. 510). During spawning season, the overall body color of breeding males darkens, and the side markings become obscure or appear as a series of blotches (Etnier and Starnes 1993, p. 510).

The Cumberland darter inhabits pools or shallow runs of low- to moderate-gradient sections of second- to fourth-order streams with stable sand, silt, or sand-covered bedrock substrates (O'Bara 1988, pp. 10–11; O'Bara 1991, p. 10; Thomas 2007, p. 4). Thomas (2007, p. 4) did not encounter the species in high-gradient sections of streams or areas dominated by cobble or boulder substrates. Thomas (2007, p. 4) reported that streams inhabited by Cumberland darters were second to fourth order, with widths ranging from 4 to 9 meters (m) (11 to 30 feet (ft)) and depths ranging from 20 to 76 cm (8 to 30 in). Most of these habitats contain isolated boulders and large cobble that the species likely uses as cover.

Limited information exists with regard to upstream or downstream movements of Cumberland darters; however, Winn (1958a, pp. 163-164) reported considerable pre-spawn movements for its closest relative, the Johnny darter. In Beer Creek, Monroe County, Michigan, Johnny darters migrated several miles between temporary stream habitats and permanent pools in downstream reaches. Recent capture data for tagged individuals in Cogur Fork, McCreary County, Kentucky, demonstrate that Cumberland darters may make similar movements (Thomas pers. comm. 2010). Individuals tagged and released by the Kentucky Department of Fish and Wildlife Resources (KDFWR) and Conservation Fisheries, Inc. (CFI) traveled distances ranging from 0.4 to 0.7 kilometers (km) (0.2 to 0.4 miles (mi)) between their release date of September 22, 2010 and their recapture date of November 9, 2010 (period of 48 days) (Thomas pers. comm. 2010). Over longer periods, it is likely that Cumberland darters can utilize stream reaches larger than 0.7 km (0.4 mi).

Little is known regarding the reproductive habits of the Cumberland darter. Thomas (2007, p. 4) reported the collection of males in breeding condition in April and May, with water temperatures ranging from 15 to 18 degrees Celsius (°C) (59 to 64 degrees Fahrenheit (°F)). Extensive searches by Thomas (2007, p. 4) produced no evidence of nests or eggs at these sites. Reproductive habits of its closest relative, the Johnny darter, have been well studied by Winn (1958a, pp. 163-183), Winn (1958b, pp. 205-207), Speare (1965, pp. 308-314), and Bart and Page (1991, pp. 80-86). Spawning occurs from April to June, with males migrating to spawning areas prior to females and establishing territories at selected spawning sites. Males establish a nest under a submerged object (boulder, woody debris) by using fin movements to remove silt and debris. Females enter the nests, the spawning pair inverts, and females deposit between 40 and 200 adhesive eggs on the underside of the nest object. Males care for the nest by periodically fanning the area to remove silt. The eggs hatch in about 6 to 16 days, depending on water temperature. Hatchlings are about 5 mm (0.2 in) and reach 29 to 38 mm (1.1 to 1.5 in) at age 1.

Species commonly associated with the Cumberland darter during surveys by Thomas (2007, pp. 4–5) were creek chub (*Semotilus atromaculatus*), northern hogsucker (*Hypentelium nigricans),* stripetail darter *(E. kennicotti),* and Cumberland arrow darter *(E. sagitta sagitta*). Feeding habits are unknown but are likely similar to that of the closely related Johnny darter (*E. nigrum*). Johnny darters are diurnal sight feeders, with prey items consisting of midge larvae, mayfly nymphs, caddisfly larvae, and microcrustaceans (Kuehne and Barbour 1983, p. 104; Etnier and Starnes 1993, p. 511). Similar to other darters, juvenile Cumberland darters likely feed on planktonic organisms or other small invertebrates.

Distribution, Abundance, Trends: The Cumberland darter is endemic to the upper Cumberland River system above Cumberland Falls in Kentucky and Tennessee (O'Bara 1988, p. 1; O'Bara 1991, p. 9; Etnier and Starnes 1993, p. 511). The earliest known collections of the species were made by Jordan and Swain (1883, pp. 249–250), who recorded it as abundant in tributaries of Clear Fork of the Cumberland River, Kentucky. The species was later reported from Gum Fork, Scott County, Tennessee, by Shoup and Peyton (1940, p. 11), and seven additional tributaries of the Cumberland River by Burr and Warren (1986, p. 310). More exhaustive surveys by O'Bara (1988, p. 6; 1991, pp. 9–10) and Laudermilk and Cicerello (1998; pp. 83–233, 303–408) determined that the Cumberland darter was restricted to short reaches of 20 small streams (23 sites) in the upper Cumberland River system in Whitley and McCreary Counties, Kentucky, and Campbell and Scott Counties, Tennessee. These studies suggested the extirpation of the species from Little Wolf Creek in Whitley County, Kentucky and Gum Fork in Scott County, Tennessee. Preliminary reports of disjunct populations in the Poor Fork Cumberland River and Martins Fork in Letcher and Harlan Counties, Kentucky (Starnes and Starnes 1979, p. 427; O'Bara 1988, p. 6; O'Bara 1991, pp. 9–10) were evaluated genetically and determined to be the Johnny darter (Strange 1998, p. 101).

Thomas (2007, p. 3) provided the most recent information on status and distribution of the species through completion of a range-wide status assessment in the upper Cumberland River drainage in Kentucky. Between June 2005 and April 2007, a total of 47 sites were sampled qualitatively in the upper Cumberland River drainage. All Kentucky sites with historic records were surveyed (20 sites), as well as 27 others having potentially suitable habitat. Surveys by Thomas (2007, p. 3) produced a total of 51 specimens from 13 localities (12 streams). Only one of the localities represented a new occurrence record for the species.

In 2008, the KDFWR initiated a propagation and reintroduction project for the Cumberland darter in the upper Cumberland River drainage (Thomas *et al.* 2010, p. 107). Utilizing State Wildlife Grant funds from the Service, KDFWR worked cooperatively with CFI of Knoxville, Tennessee, to develop captive propagation protocols for the species and to produce juvenile Cumberland darters that could be reintroduced within the species' historic range. Cogur Fork, a tributary to Indian Creek in McCreary County, Kentucky, was chosen by KDFWR as a suitable reintroduction site. Cumberland darters were released into Cogur Fork in August 2009 and September 2010. Surveys in November 2010 resulted in recaptures of individuals released in 2009 and 2010, as well as captures of four individuals without tags (possibly native individuals) (Thomas pers. comm. 2010). Based on these results, it appears that reintroduction efforts have been effective, with Cumberland darters persisting within Cogur Fork since 2009. Furthermore,

captures of untagged individuals in 2009 and 2010 suggest that Cogur Fork also supports a small, native population of the species.

Currently, the Cumberland darter is known from 15 localities in a total of 13 streams in Kentucky (McCreary and Whitley Counties) and Tennessee (Campbell and Scott Counties)[1]. All 15 extant occurrences of the Cumberland darter are restricted to short stream reaches, with the majority believed to be restricted to less than 1.6 kilometers (km) (1 mile (mi)) of stream (O'Bara 1991, pp. 9–10; Thomas 2007, p. 3). These occurrences are thought to form six population clusters (Bunches Creek, Indian Creek, Marsh Creek, Jellico Creek, Clear Fork, and Youngs Creek), which are geographically separated from one another by an average distance of 30.5 stream km (19 stream mi) (O'Bara 1988, p. 12; O'Bara 1991, p. 10; Thomas 2007, p. 3). Based on collection efforts by O'Bara (1991, pp. 9–10), Laudermilk and Cicerello (1998; pp. 83–233, 303–408), and Thomas (2007, p. 3), the species appears to be extirpated from 11 historical collection sites and a total of 9 streams: Cumberland River mainstem, near the mouth of Bunches Creek and Cumberland Falls (Whitley County); Sanders Creek (Whitley County); Brier Creek (Whitley County); Kilburn Fork of Indian Creek (McCreary County); Bridge Fork (McCreary County); Marsh Creek, near mouth of Big Branch and Caddell Branch (McCreary County); Cal Creek (McCreary County); Little Wolf Creek (Whitley County); and Gum Fork (Scott County). No population estimates or status trends are available for the Cumberland darter; however, survey results by Thomas (2007, p. 3) suggest that the species is uncommon or occurs in low densities across its range (Thomas 2007, p. 3).

The Cumberland darter is ranked by the Kentucky State Nature Preserves Commission (KSNPC) (2009, p. 38) and the Tennessee Department of Environment and Conservation (TDEC) (2009, p. 53) as a G1G2S1 species: critically imperiled or imperiled globally and critically imperiled in Kentucky and Tennessee. The KDFWR State Wildlife Action Plan identified the Cumberland darter as a species of Greatest Conservation Need (GCN) and identified several top conservation actions for it and other species in its Aquatic Guild (Upland Headwater Streams in Pools), including: Acquisition or conservation easements for critical habitat, development of financial incentives to protect riparian (land adjacent to stream channel) corridors, development and implementation of best management practices, and restoration of degraded habitats through various State and Federal programs (KDFWR 2005, p. 2.2.2). The Cumberland darter is designated as a Tier 1 GCN species in the Tennessee Comprehensive Wildlife Conservation Strategy (CWCS) (Tennessee Wildlife Resources Agency (TWRA) 2005, pp. 44, 49).

B. THREAT ASSESSMENT

In this outline, we present a summary of threats affecting the Cumberland darter and the species' habitat. A detailed evaluation of factors affecting the species can be found in the listing determination (76 FR 48722). The most significant threat to the Cumberland darter is the destruction, modification, or curtailment of its habitat or range caused by a variety of human-induced impacts such as siltation, water pollution, disturbance of riparian corridors, and changes

[1] The final rule (76 FR 48722) listing the Cumberland darter as endangered says the species is known from 12 streams. However, the information presented in the final rule is incorrect. The species is known from 13 streams, not 12.

in channel morphology (Waters 1995, pp. 2–3; Skelton 1997, pp. 17, 19; Thomas 2007, p. 5). The species is also threatened by the inadequacy of existing regulatory mechanisms and its restricted range and small population size.

Water and Habitat Quality: The Cumberland darter's preferred habitat characteristics (i.e., low- to moderate-gradient, low current velocity, backwater nature) make it extremely susceptible to the effects of siltation (excess sediments suspended or deposited in a stream) (O'Bara 1991, p. 11). Sediment has been shown to abrade and suffocate bottom-dwelling fish and other organisms by clogging gills; reduce aquatic insect diversity and abundance; impair fish feeding behavior by altering prey base and reducing visibility of prey; impair reproduction due to burial of nests; and, ultimately, negatively impact fish growth, survival, and reproduction (Waters 1995, pp. 5–7, 55–62; Knight and Welch 2001, pp. 134–136). Wood and Armitage (1997, pp. 211–212) identified at least five impacts of sedimentation on fish, including (1) reduction of growth rate, disease tolerance, and gill function; (2) reduction of spawning habitat and egg, larvae, and juvenile development; (3) modification of migration patterns; (4) reduction of food availability through the blockage of primary production; and (5) reduction of foraging efficiency.

Sediment (siltation) has been listed repeatedly by Kentucky Division of Water (KDOW) as the most common stressor of aquatic communities in the upper Cumberland River basin (KDOW 1996, pp. 50–53, 71–75; KDOW 2002, pp. 39–40; KDOW 2006, pp. 178–185). The primary source of sediment was identified by KDOW as resource extraction (e.g., coal mining, logging), but other known sources include agricultural activities, road construction and maintenance, and urban development (Waters 1995, pp. 2–3; KDOW 2006, pp. 178–185; Skelton 1997, pp. 17, 19; Thomas 2007, p. 5). Five streams within the Cumberland darter's current range, Jenneys Branch (Indian Creek basin), an unnamed tributary of Jenneys Branch (Indian Creek basin), Ryans Creek (Jellico Creek basin), Marsh Creek, and Wolf Creek (Clear Fork basin), have been identified as impaired due to siltation and have been included on Kentucky's 303(d) list of impaired waters (KDOW 2007, pp. 155–166).

Siltation can also occur in the Cumberland darter's known habitat as a result of construction activities for human development. For example, during the fall of 2007, an 8.4-km (5.2-mi) reach of Barren Fork in McCreary County, Kentucky, was subjected to a severe sedimentation event (Floyd pers. obs. 2008). This event occurred despite the fact that approximately 95 percent of the Barren Fork watershed is under Federal ownership within the Daniel Boone National Forest (DBNF). Construction activities associated with the development of a 40.5-hectare (ha) (100-acre (ac)) park site caused excessive sedimentation of two unnamed headwater tributaries of Barren Fork. Successive, large rainfall events in September and October carried sediment offsite and impacted downstream areas of Barren Fork known to support Cumberland darters and the Federally threatened blackside dace (*Chrosomus cumberlandensis*). Site visits by Service staff at the Kentucky Field Office (KFO) in September 2007 confirmed that sediment had been carried offsite, resulting in significant habitat degradation in the Barren Fork mainstem. The Service (KFO) is currently working with the McCreary County fiscal court to stabilize and monitor habitats within the Barren Fork mainstem.

Another significant threat to the Cumberland darter is water quality degradation caused by inputs of non-point source pollutants. Coal mining represents a major source of non-point source

pollutants in the upper Cumberland River basin (O'Bara 1991, p. 11; Thomas 2007, p. 5), because it has the potential to contribute high concentrations of dissolved metals and other solids that lower stream pH or lead to elevated levels of stream conductivity (Pond 2004, pp. 6–7, 38–41; Mattingly *et al.* 2005, p. 59). These impacts have been shown to negatively affect fish species, including listed species, in the Clear Fork system of the Cumberland basin (Weaver 1997, pp. 29; Hartowicz pers. comm. 2008). The direct effect of elevated stream conductivity on fishes, including the Cumberland darter, is poorly understood, but some species, such as blackside dace, have shown declines in abundance over time as conductivity increased in streams affected by mining (Hartowicz pers. comm. 2008). Studies indicate that blackside dace are generally absent when conductivity values exceed 240 microSiemens/cm (µS/cm) (Mattingly *et al.* 2005, p. 59; Black and Mattingly 2007, p. 12).

Other non-point source pollutants that affect the Cumberland darter and its habitats include agricultural pollutants such as fertilizers, pesticides, herbicides, and animal waste; domestic sewage (through septic tank leakage or straight pipe discharges); and other chemicals associated with oil and gas development. Non-point source pollutants can cause excess nutrification (increased levels of nitrogen and phosphorus), excessive algal growth, instream oxygen deficiencies, increased acidity and conductivity, and other changes in water chemistry that can seriously impact aquatic species (KDOW 1996, pp. 48–50; KDOW 2006, pp. 70–73).

In addition to water quality impacts, activities associated with resource extraction (surface coal mining, silviculture, natural gas exploration and development), agriculture, maintenance of county roads, and residential development degrade Cumberland darter habitats through physical disturbance of riparian and instream habitats. These activities degrade Cumberland darter habitats through removal of riparian vegetation, stream bank disturbance, substrate removal (gravel mining), and channelization (Waters 1995, pp. 2–3; KDOW 2006, pp. 178–185; Skelton 1997, pp. 17, 19; Thomas 2007, p. 5).

Existing Regulatory Mechanisms: The Cumberland darter and its habitats are afforded some protection from water quality and habitat degradation under the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq.*), Kentucky's Forest Conservation Act of 1998 (KRS 149.330-355), Kentucky's Agriculture Water Quality Act of 1994 (KRS 224.71-140), additional Kentucky laws and regulations regarding natural resources and environmental protection (KRS 146.200-360; KRS 224; 401 KAR 5:026, 5:031), and Tennessee's Water Quality Control Act of 1977 (T.C.A. 69-3-101). However, as demonstrated above, population declines and degradation of habitat for this species are ongoing despite the protection afforded by these laws and corresponding regulations. While these laws have resulted in some improvements in water quality and stream habitat for aquatic life, including the Cumberland darter, they alone have not been adequate to fully protect this species; sedimentation and non-point source pollutants continue to be a significant problem.

The Cumberland darter has been designated as an endangered species by Tennessee (TWRA 2005, p. 240) and Kentucky (KSNPC 2005, p. 11), but the designation in Kentucky conveys no legal protection. Under the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 (Tennessee Code Annotated §§ 70-8-101-112), "[I]t is unlawful for any person to take, attempt to take, possess, transport, export, process, sell or offer for sale or

ship nongame wildlife, or for any common or contract carrier knowingly to transport or receive for shipment nongame wildlife." Further, regulations included in the Tennessee Wildlife Resources Commission Proclamation 00-15 Endangered Or Threatened Species state the following: "Except as provided for in Tennessee Code Annotated, Section 70-8-106 (d) and (e), it shall be unlawful for any person to take, harass, or destroy wildlife listed as threatened or endangered or otherwise to violate terms of Section 70-8-105 (c) or to destroy knowingly the habitat of such species without due consideration of alternatives for the welfare of the species listed in (1) of this proclamation, or (2) the United States list of Endangered fauna." Under these regulations, potential collectors of this species are required to have a State collection permit, therefore protecting against potential threats under Listing Factor B (overutilization for commercial, recreational, scientific, or educational purposes). However, in terms of project management, and potential habitat disturbance, this regulation only provides for the consideration of alternatives, and does not require the level of project review afforded by the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

In 8 of 13 streams where the Cumberland darter still occurs, the species receives incidental protection under the Act because these streams (or basins) also support the Federally threatened blackside dace and occupy watersheds that are at least partially owned by the Federal government (i.e., DBNF). The five remaining streams supporting populations of the Cumberland darter are not afforded this protection.

Restricted Range and Population Size: The Cumberland darter has a limited geographic range with small population sizes. Its existing populations are extremely localized and geographically isolated from one another, leaving them vulnerable to localized extinctions from intentional or accidental toxic chemical spills, habitat modification, progressive degradation from runoff (non-point source pollutants), natural catastrophic changes to their habitat (e.g., flood scour, drought), other stochastic disturbances, and to decreased fitness from reduced genetic diversity. Potential sources of unintentional spills include accidents involving vehicles transporting chemicals over road crossings of streams inhabited by the species, or the accidental or intentional release into streams of chemicals used in agricultural or residential applications.

Species that are restricted in range and population size are more likely to suffer loss of genetic diversity due to genetic drift, potentially increasing their susceptibility to inbreeding depression, decreasing their ability to adapt to environmental changes, and reducing the fitness of individuals (Soule 1980, pp. 157–158; Hunter 2002, pp. 97–101; Allendorf and Luikart 2007, pp. 117–146). It is likely that some of the Cumberland darter populations are below the effective population size required to maintain long-term genetic and population viability (Soule 1980, pp. 162–164; Hunter 2002, pp. 105–107). The long-term viability of a species is founded on the conservation of numerous local populations throughout its geographic range (Harris 1984, pp. 93–104). These separate populations are essential for the species to recover and adapt to environmental change (Noss and Cooperrider 1994, pp. 264–297; Harris 1984, pp. 93–104). The level of isolation seen in the Cumberland darter makes natural repopulation following localized extirpations virtually impossible without human intervention.

In summary, the Cumberland darter is threatened by the destruction, modification, or curtailment of its habitat or range, the inadequacy of existing regulatory mechanisms, and other natural and

manmade threats. Activities associated with surface coal mining, silviculture, agriculture, road construction, and urban development have caused chemical and physical degradation of habitats across the species' range. These threats continue despite the protection afforded by State and Federal laws and corresponding regulations. The species' restricted range and small population sizes make it vulnerable to localized extinctions from intentional or accidental chemical spills, habitat modification, natural or human-induced catastrophic change, and decreased fitness due to reduced genetic diversity. These problems may be exacerbated by the effects of climate change, which could intensify or increase the frequency of drought events. All of these threats are considered imminent and of high magnitude throughout the species' entire range. We have no information indicating that the magnitude or imminence of these threats is likely to be appreciably reduced in the foreseeable future.

C. CONSERVATION ACTIONS

There are no written agreements currently in place for this species or its habitat. In 2008, the KDFWR initiated a propagation and reintroduction project for the Cumberland darter in the upper Cumberland River drainage (Thomas *et al.* 2010, p. 107). Utilizing State Wildlife Grant funds from the Service, KDFWR worked cooperatively with CFI of Knoxville, Tennessee, to develop captive propagation protocols for the species and to produce juvenile Cumberland darters that could be reintroduced within the species' historic range. Cogur Fork, a tributary to Indian Creek in McCreary County, Kentucky, was chosen by KDFWR as a suitable reintroduction site. Cumberland darters were released into Cogur Fork in August 2009 and September 2010. Surveys in November 2010 resulted in recaptures of individuals released in 2009 and 2010, as well as captures of four individuals without tags (possibly native individuals) (Thomas pers. comm. 2010). Based on these results, it appears that reintroduction efforts have been effective, with Cumberland darters persisting within Cogur Fork since 2009. Furthermore, captures of untagged individuals in 2009 and 2010 suggest that Cogur Fork also supports a small, native population of the species.

In cooperation with the KFO's Partners for Fish and Wildlife program and KDFWR, ongoing conservation actions for the Cumberland darter will include control of livestock access through fencing and alternative water sources; protection, enhancement, or restoration of riparian habitats through easements, stream buffer establishment and maintenance, installation and maintenance of erosion control measures, and foregoing detrimental land use practices; protection, enhancement, or restoration of aquatic habitats through stream easements, stream de-channelization, installation of in-stream habitat features, stream bank stabilization, and road crossing stabilization; and species propagation and reintroduction.

III. PRELIMINARY RECOVERY STRATEGY

A. RECOVERY PRIORITY NUMBER WITH RATIONALE

The Cumberland darter is assigned a recovery priority of 5, which indicates the species faces a high degree of threat and demonstrates a low recovery potential. The recovery potential is considered low for the Cumberland darter because the majority of its historical range has been altered physically and chemically. Physical impairment can be improved with various restoration techniques, but water quality restoration will be more difficult.

B. RECOVERY STRATEGY

The majority of streams within the upper Cumberland River basin have been modified from their historical condition due to a number of human-induced activities (e.g., surface coal mining, silviculture, agriculture, residential development, and road construction). The Cumberland darter has suffered from these impacts. The species has been extirpated from at least eight streams and is now restricted to several isolated segments of Cumberland River tributaries. Conservation and recovery of the species will require human intervention for decades to come. It is known that human activities, population numbers, and associated impacts will change within drainage watersheds. Therefore, it is essential to characterize and monitor aquatic habitats on a watershed scale, and respond to changing conditions rapidly, whether through negotiation and partnerships to alleviate threats or through husbandry and reintroduction of endangered species populations to appropriate areas. This approach will require monitoring extant populations of the Cumberland darter, along with routine periodic monitoring of habitat conditions.

C. INITIAL ACTION PLAN

In an effort to protect and recover the Cumberland darter in its historic range (to the extent possible), the Service proposes the following conservation actions:

1. Work cooperatively with regulatory agencies to protect habitat integrity and quality of stream segments that currently support or could support the species.

2. Seek voluntary, cooperative agreements with landowners as a practical and economical means of reducing non-point source pollution from private land use.

3. Encourage and support community based watershed stewardship planning and action.

4. Develop and implement programs to educate the public and private industry on the need and benefits of ecosystem management, and to involve them in watershed stewardship and Cumberland darter conservation efforts.

5. Identify and prioritize areas in the upper Cumberland River basin for protection, enhancement, and restoration.

6. Work cooperatively with the DBNF and other partners (KDFWR, KSNPC) to develop a strategic conservation plan for listed and at-risk fishes in the upper Cumberland River basin.

7. Conduct basic research on the Cumberland darter and apply the results toward management and protection of the species.

8. Continue to develop and implement technology for maintaining and propagating the Cumberland darter in captivity.

9. Continue augmentation efforts in Cogur Fork (DBNF), McCreary County, Kentucky and initiate similar actions in other suitable habitats.

10. Monitor existing Cumberland darter populations and their habitats; initiate searches for unknown populations.

IV. PREPLANNING PROCESS

A. PLANNING APPROACH

A recovery plan will be prepared for the Cumberland darter. The recovery plan will include objective and measurable criteria which, when met, will ensure the conservation of the species without the need for federal listing. Recovery criteria will address all meaningful threats to the species, as well as estimate the time and the cost to achieve recovery. The recovery plan will be prepared by the Kentucky Ecological Services Field Office, with review by the Cookeville, Tennessee Ecological Services Field Office. The draft recovery plan should be finalized and sent to the Regional Office for review in December 2013. The final recovery plan should be finalized and sent to the Regional Office for review by July 2014. These timelines may be affected by available resources and regional priorities.

B. STAKEHOLDER INVOLVEMENT

During the recovery planning process, input, comments and review will be sought from multiple stakeholders within Kentucky and Tennessee. These will include State and Federal agencies, industrial and agricultural groups, research universities, and conservation organizations. Many stakeholders are currently cooperating in ongoing aquatic conservation planning and action groups within the upper Cumberland River basin.

Approve: _____ Date: OCT 13 2011

Regional Director, Region 4

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