U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Etheostoma cragini

Common Name:

Arkansas darter

Lead region:

Region 6 (Mountain-Prairie Region)

Information current as of:

03/23/2012

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Arkansas, Colorado, Kansas, Missouri, Oklahoma
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Arkansas, Colorado, Kansas, Missouri, Oklahoma
- **US Counties**: Benton, AR, Washington, AR, Baca, CO, Bent, CO, Cheyenne, CO, Crowley, CO, Elbert, CO, El Paso, CO, Fremont, CO, Huerfano, CO, Kiowa, CO, Las Animas, CO, Lincoln, CO, Otero, CO, Prowers, CO, Barber, KS, Barton, KS, Cherokee, KS, Clark, KS, Comanche, KS, Cowley, KS, Harper, KS, Kingman, KS, Kiowa, KS, Meade, KS, Morton, KS, Pratt, KS, Reno, KS, Rice, KS, Sedgwick, KS, Seward, KS, Stafford, KS, Sumner, KS, Barry, MO, Barton, MO, Dade, MO, Jasper, MO, Lawrence, MO, Newton, MO, Beaver, OK, Cherokee, OK, Craig, OK, Delaware, OK, Harper, OK, Mayes, OK, Ottawa, OK, Rogers, OK
- **Countries**:Country information not available

Land Ownership:

The Arkansas darter predominantly occurs on privately owned property (>95%).

Lead Region Contact:

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Biological Information

Species Description:

The Arkansas darter is a small 2.5 inch fish in the perch family native to the Arkansas River basin. Distler and Metcalf (1962, pp. 556-561) describe the Arkansas darter as a moderately stout darter with six to eight indistinct dark cross-bars on the back, sometimes not evident. The body and head are thickly covered with fine black spots; the cheek beneath the eye has a narrow dusky vertical spot. Gill covers are not broadly connected by membrane across the throat; the distance from the membrane notch to front of lower lip is much less than the distance from this notch to the front of the pelvic fin base. Midline of belly is without enlarged and modified scales, the lateral line is incomplete with 25 or less pored scales. It has a spinous dorsal fin with 9 or 10 spines, the anal fin has 2 stiff spines and 6 to 8 rays. Adults are commonly 4.1 to 5.6 centimeters (cm) (1.6 – 2.2 inches (in.)) in length, with a maximum length of 6.5 cm (2.6 in.). In breeding males the gill membranes, ventral surface, and underside of caudal peduncle are orange, with a diffuse orange band through the dorsal fin.

Taxonomy:

The Arkansas darter was discovered by F.W. Cragin in 1885 in an unnamed tributary to the Arkansas River, near Garden City, Kansas (Gilbert 1885, pp. 97-99). An Ozark population discovered later received a separate description (Meek 1894, p. 957). Currently, we consider the specific classification description (*Etheostoma cragini* Gilbert) provided by Distler and Metcalf (1962, pp. 556-561) to be accurate for the species throughout its range.

Habitat/Life History:

The species occurs most often in sand- or pebble bottomed pools of small, spring-fed streams and marshes, with cool water (generally less than 25°C (77°F)), and broad-leaved aquatic vegetation (Cross 1967, pp. 311-312; Distler 1972, pp. 439 441; Moss 1981, pp. 3-4; Pigg 1987, pp. 45-59; Robison *et al*. 1974; Taber *et al*. 1986, pp. 207 214). Adult Arkansas darters can be found near undercut banks where terrestrial vegetation extends into flowing water (Taber *et al*. 1986, pp. 207-214). However, most individuals are thought to occur where streams are exposed to sunlight, which is important for the growth of aquatic vascular plants (Moss 1981, pp. 3-4).

Arkansas darters feed on a variety of aquatic insects and some plant material, including small seeds. Mayflies are their main source of food. The species sexually matures in 1 year or less. Most populations are dominated by individuals less than 2 years old. Maximum age is 3 years. Arkansas darters can spawn throughout spring and summer. Spawning takes place in shallow water over a bottom of coarse gravel. Eggs are usually deposited in open areas on organic material that covers a sandy streambed. Young darters tend to occupy more open areas, while adult darters use areas with more aquatic vegetation.

Historical Range/Distribution:

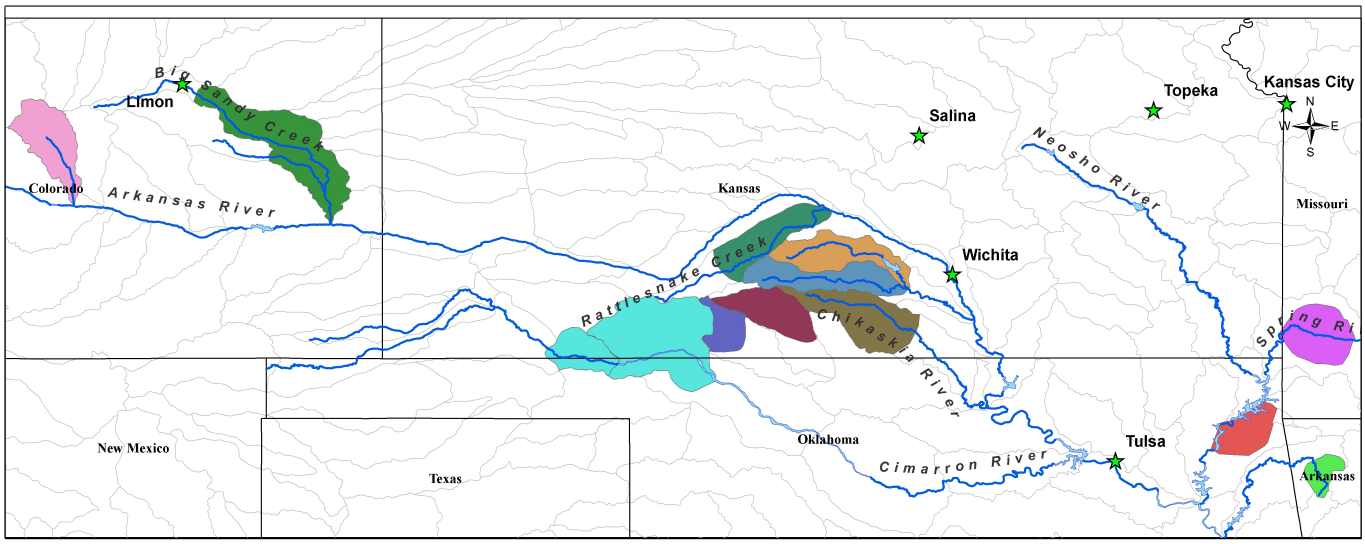
Historic records for the Arkansas darter are limited, with the species likely occurring throughout a range including: southwestern Missouri, northwestern Arkansas, northern Oklahoma, southern Kansas, and eastern Colorado. The species may have existed in spring-fed habitats throughout its range. Its current distribution is indicative of a species that once was widely dispersed throughout its range, but has been relegated to isolated areas surrounded by unsuitable habitat that prevents dispersal. The most upstream collection is from a small unnamed drainage originating on the Fort Carson Military Reservation in El Paso County, Colorado (Miller 1984, pp. 497-498). The farthest downstream site is from Wilson Spring at the intersection of Arkansas Highway 112 and U.S. Highway 71 Bypass in Fayetteville, Washington County, Arkansas (Robison and Buchanan 1988, pp. 416-418).

Historic records of the species suggest that its distribution may have been continuous from Colorado to Kansas and Oklahoma prior to European settlement (Eberle and Stark 2000, pp. 103 105).

• In Colorado, three records exist prior to 1980, with the oldest being by Ellis and Jaffa in 1918 (Cross 1967, pp. 311-313). Little documentation of historic range exists.
• In Kansas, the Arkansas darter historically occurred in the southwestern one-third of the State and was relatively abundant (Eberle and Stark 2000, pp. 105 108). The type locality for the species given by Gilbert in 1885 was from a small brook in Garden City, Kansas (Cross 1967, pp. 311-313).
• In northeastern Oklahoma, 10 historic localities are known from the eastern tributaries of the Neosho River, and 1 historic locality is known from the Big Cabin Creek drainage (Martinez 1996, pp. 14-17). The species was abundant in the 1950s and 1960s in Crooked Creek (Cimarron drainage) of northwestern Oklahoma and southwestern Kansas (Cross 1967, pp. 311-313).
• The Arkansas darter was collected historically from 14 sites within the southwestern part of Missouri, where it was considered locally abundant (Pflieger 1992, pp. 5-8).
• The species was unknown from Arkansas until 1979. Between 1979 and 2001, it was found at nine locations in spring runs in the Illinois River drainage in northwestern Arkansas (Hargrave and Johnson 2003, pp. 89-91).

Current Range Distribution:

Areas of occurrence for the Arkansas darter can be described on three levels: (1) geographic/state boundaries; (2) watershed boundaries; and (3) sub-watershed boundaries. These descriptors result from believed anthropogenic changes in the riverine systems since European settlement of the Great Plains (Eberle and Stark 2000, pp. 103-105), resulting in a discontinuous distribution. Factors influencing the current distribution include: surface and groundwater irrigation resulting in decreased flows or stream dewatering; the dewatering of long reaches of riverine habitat necessary for species movement when surface flows do occur; conversion of prairie to cropland influencing groundwater recharge and spring flows; and the construction of dams which act as barriers preventing emigration upstream and downstream through the reservoir pool. The following is a state-by-state description of the current distribution for Arkansas darter.



Watersheds with Arkansas Darter

Watershed Name

- Fountain (UA1)
- Big Sandy/Rush (UA2)
- Cimarron (MA1)
- Medicine Lodge (MA2)
- Salt Fork (MA3)
- South Fork Ninnescah (MA4)
- North Fork Ninnescah (MA5)
- Chikaskia (MA6)
- Rattlesnake (MA7)
- Spring (NE1)
- Lower Neosho (NE2)
- Illinois (NE3)

- Watersheds (HUC8)
- Major Cities
- Major Rivers
- States

0 62.5125 250 375 500 Kilometers

TABLE 1. Current Range of the Arkansas Darter

Region - State	Watershed/Area	# of Collections by Year Since 1997	Streams
Upper Arkansas Drainage (UA) - Southeastern CO	UA1 – Tributaries of Arkansas River upstream of John Martin Reservoir	7 (Nessler, et al.1999) 2 (Crockett 2010)	Fountain, Horse, Black Squirrel, & Chico Creeks
Upper Arkansas Drainage (UA) - Southeastern CO	UA2 – Tributaries of Arkansas River downstream of John Martin Reservoir	22 (Nessler, et al.1999); 5 in 2008-2009 (Nessler 2010, pers. comm.) 12 (Crockett 2010)	Rush, Big Sandy1, Big Sandy2, Buffalo, Wild Horse & Willow Creeks; Vista Del Rio & West May Valley Ditches
Middle Arkansas Drainage (MA) - Southwestern KS & Northwestern OK	MA1 – Cimarron River & tributaries	12 in KS (Tabor 2005, 2006); 4 in OK (Martinez & Fenner 2009) 1 in KS (Fenner 2012)	Cimarron River; Crooked, Big Sandy, Cavalry, Cottonwood, & Kiowa Creeks
Middle Arkansas Drainage (MA) - Southwestern KS	MA2 – Medicine Lodge River & tributaries	7 (Tabor 2005, 2006); 6 (Eberle & Stark 1998)	Medicine River; Elm, Bear, Turkey, Thompson, Oak, Sand, & Stolp Creeks
Middle Arkansas Drainage (MA) - Southwestern KS	MA3 - Salt Fork Arkansas River & tributaries	10 (Eberle & Stark 1998)	Inman, Oak, Mule, Spring, Snooks, Indian, W. Nescatunga, E. Nescatunga, Red Fork, & Christy Canyon Creeks
Middle Arkansas Drainage (MA) - South-Central KS	MA4 - South Fork Ninnescah River & tributaries	4 (Tabor 2006); 4 (Eberle & Stark 1998)	South Fork Ninnescah River; Painter, Smoots, Pat, & Natrona Creeks
Middle Arkansas Drainage (MA) - South-Central KS	MA5 - North Fork Ninnescah River & tributaries	7 (VanScoyoc 2012) 3 (Tabor 2006); 5 (Eberle & Stark 1998)	North Fork Ninnescah River; Goose & Silver Creeks
Middle Arkansas Drainage (MA) - South-Central KS	MA6 - Chikaskia River & tributaries	5 (Tabor 2006); 5 (Eberle & Stark 1998)	Chikaskia & N. Fork Chikaskia River; Wild Horse & Allen Creeks; Unnamed tributaries
Middle Arkansas Drainage (MA) - South-Central KS	MA7 – Arkansas River, Rattlesnake Creek & tributaries	0 (Tabor 2006); *1 in 1995 (KDWP); 1 in 1996, (Eberle & Stark 1998); 1 in 2009 (KDWP 2009)	Rattlesnake Creek & Artesian Marsh
Neosho Drainage (NE) - Southwestern MO	NE1 – Spring River & tributaries (Neosho/Grand basin)	43 (Combes & Winston 2003)	Spring River; Shoal & Center Creeks & their tributaries
Neosho Drainage (NE) - Northeastern OK	NE2 – Tributaries of lower Neosho River (Neosho/Grand basin)	6 (Martinez & Fenner 2009)	Fivemile Creek, Beasley Spring, Unnamed trib to Spavinaw Creek, Unnamed trib to Fourteen Mile Creek, Kelly & Olive Springs
Neosho Drainage (NE) - Northwestern AR	NE3 – Tributaries to Illinois River (Neosho/Grand basin)	15 (Wagner & Kottmyer 2005) 28 (Wagner et al. 2011)	Clabber, Wildcat & Little Osage Creeks: Wilson Spring, Unnamed spring runs

Colorado - The Arkansas darter primarily occurs within three drainages in the southeastern part of the state: Fountain Creek, Rush Creek, and Big Sandy Creek (Loeffler and Krieger 1994, pp. 3–5). According to data gathered between 1993 and 1996 in Colorado, as much as 90 percent of available habitat is occupied, comprising approximately 30 populations (Labbe and Fausch 1997, pp. 9–10; Krieger et al. 2001, pp. 2–9). Based on the surveys over the last 15 years, biologists believe darter populations are widespread, but only show signs of stability in limited locations (Colorado Division of Wildlife (CDOW) 2007). However, these populations exhibit annual fluctuations and are generally isolated in spring-fed habitats (CDOW, 2007). In 2008 and 2009, 18 historic sites were inventoried, and 5 new sites of occurrence were documented. In 2010, Arkansas darters were collected at 14 of 15 historic sites; however Crockett (2010) indicates that the Arkansas River floodplain population downstream of John Martin Reservoir "have persisted and even thrived," while more upland populations formerly considered the most robust in the state "have held steady or perhaps lost ground, as suggested by the relatively low numbers of darters caught." The Arkansas darter

populations associated with the upper Arkansas River basin in Colorado are disjunct geographically from Kansas and Oklahoma (middle Arkansas basin) populations (Eberle and Stark 2000, pp. 103–105).

Kansas - The Arkansas darter is still locally abundant in some portions of its range in Kansas. However, these populations are characteristically fragmented and/or isolated from other populations in adjacent drainages, and some populations have contracted or disappeared in southwestern Kansas where stream flows have been diminished by irrigation pressures (Eberle and Stark 2000, pp. 108–111).

Arkansas darters were found at 26 of 50 sites in or near its known range in south-central Kansas and northwestern Oklahoma in 1992-1993 (Tabor 1992, 1993). Eberle and Stark (2000) assessed the status of the species using data from 145 sites sampled between 1994–1997. The Arkansas darter was present at 67 (46 percent) of these localities, including 26 (67 percent) of the 39 historic collection localities sampled during their study period. In 2005–2006, 67 sites were visited, mostly at or near sites occupied by Arkansas darter in 1992–1993 (Tabor 2005, 2006). During this effort, the Arkansas darter was present at 11 of 34 sites in the Cimarron basin, with 9 sites found dry; and in the middle Arkansas drainage, the species was present at 19 of 33 sites, with 2 dry sites on Rattlesnake Creek. The species was found at 2 of 11 historic sites in Rattlesnake Creek, a middle Arkansas River tributary in 1994–1996 (Eberle and Stark 2000, pp. 105–106). In 2006, Arkansas darters were not found at any of six sites surveyed on Rattlesnake Creek (Tabor 2006). In 2009, the Kansas Department of Wildlife and Parks (KDWP) captured Arkansas darter at 12 sites in 2 streams with known populations of the species in the middle Arkansas drainage. Additionally, they captured the species from one new site on a previously undocumented stream in this area (Van Scoyoc 2010, pers. comm.). In 2011, a site on the Cimarron near Sitka, Kansas was sampled with greater than 25 juvenile Arkansas darters captured (Fenner 2012), and the species was found in seven localities in the South Fork Ninnescah watershed (VanScoyoc 2012). In the western portion of the Cimarron basin, habitat appears to have contracted since the early 1990s, with multiple sites found dry in Oklahoma and Kansas (Tabor 2005; Martinez and Fenner 2009).

Arkansas darter habitat varies both seasonally and over multi-year periods (i.e., periods of protracted drought). Thus, it can be difficult to ascertain status on the basis of occupancy of historic sites. However, a general trend of fewer and fewer occupied sites or previous sites found to be dewatered suggests that the species is in decline. Assimilating the information above on presence or absence at recent sites, we find that the overall picture for the middle Arkansas drainage suggests that the Rattlesnake Creek population and the western Cimarron River basin populations are declining; and that stable populations and habitat conditions continue to exist in the Medicine, Chikaskia, and Ninnescah watersheds, and the eastern Cimarron River tributaries (Eberle and Stark 2000, pp. 105–108; Tabor 2005, 2006; Martinez and Fenner 2009). Additional information is needed for the Salt Fork of the Arkansas River watershed.

In the Neosho basin of extreme southeastern Kansas, Arkansas darters are occasionally found in the Spring River (Combes and Winston 2003), where they are considered waifs from upstream populations in Missouri. In 2009, the KDWP captured a single Arkansas darter in a tributary to the Spring River (Van Scoyoc 2010, pers. comm.). Suitable habitat for the species is very limited in this portion of Kansas.

Missouri - Arkansas darters occur in each of the principal drainages in Missouri's Spring River system. In 1991 and 1992, the species occurred at many historic localities in the State, with 430 specimens collected from 32 of 61 localities sampled at or near historic localities (Pflieger 1992, pp. 5–8). The Arkansas darter ranked as the third most abundant of 13 darter species sampled and indicated no decline in its Missouri range. This area of Missouri was resurveyed in 2002 at 70 localities at or near sites sampled in 1991–1992; Arkansas darters were found at 43 of the 70 sites sampled, indicating that the species may be maintaining a stable metapopulation in Missouri (Combes and Winston 2003, pp. 5–11).

Arkansas - Arkansas darter were found at three of five historic localities in Arkansas in 2001. One locality was represented by a single individual and the species was not abundant at either of the other two localities (Hargrave and Johnson 2003, pp. 89–91). In 2005, the species was found at 15 sites concentrated within a 2-kilometer radius of the historic sites in the Illinois River drainage in northwestern Arkansas (Wagner and

Kottmyer 2006, pp. 5–9). In 2010–2011, Arkansas darter were captured from 13 additional sites within sub-basins with prior records of the species (Wagner *et al*. 2011). Currently, rapid urban and suburban development in the Fayetteville area is resulting in significant and immediate threats to the species in this area. These landscape changes are a serious threat to the continuing existence of the Arkansas darter in this area.

Oklahoma - In 1994–1995, 151 sites, including the 11 historic locales, were sampled for the Arkansas darter in northeastern Oklahoma (Neosho drainage) (Martinez 1996). The species was found at 17 localities on 11 streams, but only from 2 of the historic locales. In May 2009, 12 sites at or near locations where Arkansas darters were found in 1994–1995 were sampled. The species was captured in low numbers (two to eight) from six localities, and potentially from three other sites where the collections have not yet been processed (Martinez and Fenner 2009). Additional sampling is needed in this portion of the state to conclusively determine the species' status.

In northwestern Oklahoma in the early 1990s, the Arkansas darter was known from five tributaries to the Cimarron River, as well as margins of the Cimarron River itself (Pigg 1987, pp. 45–59; Tabor 1992; Eberle and Stark 2000, pp.105–108; McNeely and Caire 2003, pp. 12, 18). In Oklahoma in 2006, the species was captured at one of nine sites sampled at or near previous collection sites (Tabor 2006). In May 2009, 13 sites in the Oklahoma portion of the species range in the Cimarron watershed were again sampled. Arkansas darters were captured at 4 of these 13 sites, with numbers ranging from 2 to 14 specimens (Martinez and Fenner 2009). The Arkansas darter's range in the Cimarron River drainage in both Oklahoma and Kansas has contracted, west to east, over the last 30 years due to decreased groundwater inflows and stream dewatering. Only two south-flowing tributaries retain abundant populations of the species in the Cimarron basin.

Population Estimates/Status:

Due to the large geographic range, and the dispersed and isolated distribution of this species, estimating range-wide population numbers is extremely difficult. This problem is exacerbated by the fact that the species' habitat expands and contracts with different flow regimes across seasons and years (Labbe and Fausch 2000, pp. 1774-1791). Also problematic is that different parts of the range have been surveyed at different time periods. Furthermore, the majority of habitat occupied by this species occurs on privately owned land, limiting accessibility to perform surveys and gather species information. In this report, we have used information on species location, abundance, and distribution collected since 1997.

Based on the information presented in the preceding discussions, the Arkansas darter was present at approximately 176 localities distributed across the 5 states comprising its range. A minimum of 12 populations, or population groups (metapopulations), now exist. These 12 populations consist of 2 in the upper Arkansas River drainage in southeastern Colorado; 7 in the middle Arkansas River drainage of Kansas and northwest Oklahoma; and 3 in the Neosho River drainage of southwestern Missouri, northeastern Oklahoma, and northwestern Arkansas. Populations of Arkansas darter are currently disjunct from each other on a watershed scale due to anthropogenic effects, resulting in gaps of unsuitable habitat limiting or preventing dispersal. Unsuitable habitat types include long reaches of large mainstem rivers, long reaches of streams with no flow, long reaches of streams with no suitable habitat, and drainages segmented by dams and their resulting reservoirs. Threats to the species also vary across the range of the Arkansas darter, which influences the species' status.

The Arkansas darter is designated by state natural resource management agencies in each of the five states where it occurs as: Colorado – threatened; Kansas – threatened; Missouri delisted (stable); Arkansas – vulnerable (rare); and Oklahoma – endangered.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Groundwater Depletion

Water depletion from groundwater pumping is the greatest threat facing the Arkansas darter (Blair 1959, pp. 1–13; Cross *et al*. 1985, pp. 28–39; USFWS 1989, pp. 4–12; Eberle and Stark 2000, pp. 108–110; Krieger *et al*. 2001, pp 1–6; Layher 2002, pp. 14–21). Drying of spring-fed streams and marshes has caused localized extirpations and forced the Arkansas darter to occupy less favorable habitats in some stream reaches (Pigg 1987, pp. 45–59). Stream dewatering has reduced available habitat for the species in areas of southwestern Kansas, northwestern Oklahoma, and eastern Colorado (Krieger *et al*. 2001, pp. 1–6; Tabor 2005, 2006).

Groundwater depletion is tied to ongoing and future irrigation of agricultural commodities such as corn, wheat, and alfalfa. The number of irrigated acres in the 10 Kansas counties with Arkansas darter populations has continued to increase in recent years. The amount of irrigated land increased from 354,700 acres (ac)(143,542 hectares (ha)) in 1992 to 405,100 ac (163,938 ha) in 2007, an increase of 9 percent, or 50,400 ac (20,396 ha) over 15 years (U.S. Department of Agriculture (USDA) 1997, Table 8; USDA 2007, Table 10). The High Plains Aquifer supplies the groundwater for the western portion of the Arkansas darter's range in the Cimarron basin. In this area (Meade and Seward Counties), irrigated land increased from 179,200 ac (72,520 ha) in 2002 to 219,700 ac (88,909 ha) in 2007, an increase of 8 percent, or 40,500 ac (16,390 ha) in 5 years (USDA 2007, Table 10). The High Plains Aquifer's watertable has decreased 7.6 to 45.7 meters (25 to 150 feet) in Meade and Seward Counties, between 1960 (pre-development) and 2005, as recorded from regional monitoring wells (Kansas Geological Survey 2008, pp. 5–6). The High Plains Aquifer is the source for all springs in this portion of the Cimarron basin; and is the source for the Cimarron River where it goes from a dry to a gaining stream near the Meade/Seward County, Kansas line. New demands on groundwater reserves from an emerging ethanol industry, which may reflect the increase of irrigated acres from the High Plains Aquifer described above, may further impact stream flows and instream habitat in the future.

The High Plains Aquifer (Ogallala Formation), Rush Springs Sandstone, and the alluvial and terrace deposits of the Cimarron River produce large amounts of water (OWRB 1997, p. 30). The Oklahoma Water Resources Board (OWRB) projects that municipal and industrial water use in northwestern Oklahoma will almost double from 282,000 acre-feet in 1990, to 455,000 acre-feet in 2050 (OWRB1997, p. 50). The greatest increases would occur in Woodward and Texas Counties, which partially overlaps Arkansas darter habitat. The OWRB projects that agricultural water use in northwestern Oklahoma would increase from 694,700 acre-feet in 1990, to 1,057,700 acre-feet in 2050 (OWRB 1997, p. 54). Even though the majority of these increases would occur in the Oklahoma panhandle, outside the current range of Arkansas darter, depletions also would be concurrent since this is the same aquifer which underlies the Cimarron basin.

Surface Water Depletion

Surface water withdrawal is not a common practice and does not impact the Arkansas darter throughout the majority of its range. However, some surface water withdrawals do occur in most basins inhabited by the species and could result in localized impacts. In the Cimarron basin, several miles of the Cimarron River cease to exhibit surface flow during the summer due to this practice, and declining base flows exacerbate this condition. Surface water is diverted for irrigation, primarily within the Ditch Valley region in Harper County, Oklahoma (Old Settlers Irrigation Canal/Ditch - about 12 miles constructed in 1895), and seasonally influences stream flow. Surface water from the Cimarron River in this region is used to irrigate alfalfa and grain crops. Old Settlers Canal does not provide suitable habitat for the Arkansas darter, and any darters entrained into the system are likely lost. It also was recently determined that Horse Creek flows directly into the canal, where previously it flowed to the Cimarron, thus eliminating the potential for the species to move from the Cimarron into Horse Creek (Martinez and Fenner 2009). The last record for Arkansas darter from

Horse Creek was in 1997 (Eberle and Stark 1998, Table 1). The species was not captured during surveys of Horse Creek in 2006 and 2009, during which only one previous collection locale had surface water in 2009 (Tabor 2006; Martinez and Fenner 2009).

Vegetation Encroachment

In the Cimarron basin, declining peak flows are causing vegetation encroachment into formerly unvegetated portions of the stream channel. As vegetation encroaches, particularly woody vegetation, the stream channel narrows and flow conditions change. As the channel narrows, the stream eventually ceases to be a wide, shallow, sandy stream and becomes narrower and deeper. The resulting impacts of this to the Arkansas darter are not completely understood, but the species typically prefers streams with aquatic vegetation, which is precluded in deeper, faster flowing streams. Small numbers of Arkansas darters are now encountered in the main channel of the Cimarron largely because declining ground water levels have impacted preferred spring runs (Pigg 1987, p. 58; Tabor 1992, 1993; Martinez and Fenner 2009). If the vegetation used for spawning continues to persist at the stream margins, vegetation encroachment and stream narrowing may not significantly impact the species. However, if nonnative salt cedar (Tamarisk spp.) continues to invade and becomes more prevalent in the Cimarron River riparian zone, herbaceous vegetation used by the Arkansas darter may be detrimentally impacted. Salt cedar can become so dense that it precludes the establishment of any type of understory (including herbaceous) vegetation along the stream margin. Reductions in flow and impacts on the vegetated springs and seeps are anticipated to result in local extirpations (Cross *et al*. 1985, pp. 12–23; Woodling 1985). Pigg (1987, p. 58) believed the Arkansas darter was not secure in the western and central portions of the Cimarron River due to continuing flow depletions. Salt cedar invasion is also occurring in the streams of the upper Arkansas and middle Arkansas basins of Colorado and Kansas, but to a lesser extent at this time. Salt cedar and its related impacts to aquatic habitat has the potential to further reduce both quantity and quality of Arkansas darter habitat in the next 10 to 30 years in the Cimarron, and Upper and Middle Arkansas River basin in Kansas and Colorado. There is little to no threat recognized in the species eastern range.

Confined-animal Feeding Operations

Large confined-animal feeding operations (CAFOs), many of which have been built in Colorado, Kansas, and Oklahoma in recent years, have the potential to adversely impact ground and surface water. For example, a large lagoon spill from a CAFO occurred in Meade County, Kansas, in early 2005, resulting in a sizeable fish kill on a stream with large numbers of Arkansas darters. Habitat was still impacted by thick organic ooze along the entire stream corridor in September 2005, and it appeared that the species had little reproductive success during 2005 (Tabor 2005). Much of the west-central Cimarron basin, especially in Oklahoma, has experienced an increase in CAFOs, particularly for swine. Water from the waste lagoons are surface applied to lands within each facility. Over-application can lead to nutrient enrichment in the receiving waters. Ammonia is present in the wastewater and can cause fish kills if sufficient quantities are discharged (Collins 2008, pers. comm.). In the eastern portion of Arkansas darter’s range (Neosho drainage), large poultry operations have greatly increased in the last 15 years, and are now ubiquitous on the landscape. Manure is typically applied to crop and pasturelands for use as fertilizer and can runoff after application during rainfall events, particularly if over-applied. Likely over-application, along with other anthropogenic causes, have led to surface and groundwater contamination in the forms of ammonia and phosphates (which are toxic to fish and other aquatic life forms), fecal coliform bacteria, and pesticides (U.S. Geological Survey (USGS) 1998, pp. 19–22; Ohio State University 2008, pp. 1). Both chronic and acute threats exist to the Arkansas darter from CAFOs. Over-application or timing of application (prior to rainfall events) of CAFO waste to crop fields can result in relatively long-term eutrophication of the stream system. Catastrophic failure or large accidental discharges have the potential for mass fish kill events, possibly extirpating isolated populations of the species.

Water Quality Degradation

Sedimentation from crop field runoff and over-grazing of riparian areas impacts spawning habitat and water quality across the species' range in varying degrees. Water quality effects include nutrient enrichment and increased turbidity, which decreases dissolved oxygen and increases water temperatures. Watersheds with high levels of cultivation, and subsequent siltation and domestic pollution, are unsuitable for many prairie fish species (Cross *et al*. 1985, pp. 12–23). Severe impacts from sedimentation and overgrazing are primarily localized across the range of the species, with seasonal animal feeding areas (winter stomp lots) being the most common activity causing these effects (Tabor 2009, pers. comm.). Stomp lots are unregulated areas where relatively few cattle (200 or less) are fed and watered during the winter (commonly in a low area or floodplain). During spring thunderstorms producing large runoff events, large quantities of nutrients, sediment, and organic matter are discharged from stomp lot locations into the surrounding stream systems.

In the eastern part of the species' range (Neosho basin), increased urban and suburban development is occurring. This development can increase runoff of fertilizers and pesticides. In most areas centralized sewer systems are not available and septic tanks are most commonly used. Waste dispersed by septic lateral fields, especially where there are many in close proximity, can infiltrate groundwater, impacting water quality in springs and streams. Suburban development, including subdivisions and farmettes, are continuing to expand in the areas of Fayetteville, Arkansas and Joplin, Missouri, within the species current range.

In southwestern Missouri and southeastern Kansas, the Ozark/Roubidoux Aquifer is being depleted, resulting in saltwater intrusion due to underlying mineral deposits in contact with lower portions of the aquifer on its western side (Kansas Water Office 2004, pp. 3–5; Kansas Geological Survey 2007, pp. 1–2; USGS 2007a, pp. 1–17; USGS 2007b, pp. 1). This intrusion could result in spring flow decreases or drying, and future degradations in water quality in the Arkansas darter's spring habitats in this area.

Development

In the Arkansas portion of the species' range, rapid urban and suburban development is resulting in significant and immediate threats to the Arkansas darter (Wagner and Kottmyer 2006, p. 10). Suburban development also is a threat in portions of the species range in northeastern Oklahoma (Martinez 2009) and in the southwestern Missouri range, where the city of Joplin is expanding. Development affects hydrology, and increases sedimentation, chemical pollution, and results in physical habitat destruction. The Arkansas darter is considered a poor competitor (Hargrave and Johnson 2003, pp. 90–92) and appears to thrive in streams with low fish diversity; this limits the ability of the species to colonize new areas when habitat is destroyed or modified. Impacts from roads and bridges are highly localized, and more prevalent in urban and suburban areas. Road and bridge construction can impact the species through increased sedimentation and stream blockage, resulting in reduced fish passage.

Dams and Reservoirs

Drainages within the range of the Arkansas darter have been segmented by dams and their resulting reservoirs which act as barriers preventing emigration upstream and downstream through the reservoir pool. Further construction of dams could increase fragmentation of populations. Englewood and Forgan Reservoirs are two potential dams proposed for construction on the Cimarron River. In its Northwest Oklahoma Water Supply Study, the Bureau of Reclamation proposed the construction of Forgan Reservoir in Beaver County, to be located on the Cimarron River near the Kansas-Oklahoma State line. This reservoir would impound about 8 kilometers (km)(5 miles (mi) of the Cimarron River. However, this reservoir has not been authorized, and planning has been deferred. Englewood Reservoir is a potential U.S. Army Corps of Engineers project that would be slightly larger than Forgan Reservoir, impounding 12 km (7 mi) of the Cimarron. Englewood Reservoir also would be located in Beaver County, a few miles downstream of the proposed Forgan site, near the Beaver/Harper County line. No active planning for this reservoir is currently underway. Both of these reservoirs, if built, would inundate currently occupied habitat and would isolate tributary populations of the species.

Summary of Factor A

In summary, groundwater withdrawals are currently impacting spring and stream flows in portions of the upper Arkansas and middle Arkansas basins of Kansas, Oklahoma, and Colorado; and the number of irrigated acres has increased in the species' southern Kansas and northwestern Oklahoma range since it was originally designated a candidate species in 1991. These activities have likely contributed to a contraction of the Arkansas darter's range in these areas. Groundwater pumping has yet to severely impact spring and stream flows in most of the eastern portion of the middle Arkansas basin in Kansas, but intensive groundwater pumping occurs in this area and could severely impact the species' habitat in the future. The invasion of salt cedar into Arkansas darter habitat exacerbates water quantity and habitat quality threats. Water quality decreases generally impact the species on a localized level, but CAFO releases and land-application of CAFO wastes can impact water quality on a watershed scale. Furthermore, urban and suburban development is currently impacting habitat in portions of the Neosho basin range, particularly the Illinois River watershed in Arkansas.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

There is no evidence to suggest overutilization of the Arkansas darter for any purpose.

C. Disease or predation:

We are not aware of any diseases that threaten the Arkansas darter. The Arkansas darter is not known to occur in streams with abundant predatory fish populations. This may be due to the small, isolated habitats that typically support the species, which naturally limit the occurrence of significant numbers of larger predators. Sport fishery enhancement efforts are designed to increase predatory sport fish numbers in impoundments, and these fish can move into streams occupied by the Arkansas darter. The impact of sport fish predation on the species is believed to be very limited at this time because typical Arkansas darter habitat is not suitable habitat for most sport fish. However, low numbers of sport fish are occasionally captured during surveys for Arkansas darter (Martinez and Fenner 2009).

D. The inadequacy of existing regulatory mechanisms:

The Arkansas darter is state-designated as endangered in Oklahoma and threatened in Colorado and Kansas. Arkansas classifies it as a vulnerable species, and it is not listed in Missouri where it is believed to be stable. The protective status in Colorado, Kansas, and Oklahoma limits the extent of direct take of the species. However, the most persistent threats to this species are adverse impacts to habitat quantity and quality, and in all States except Kansas, State regulation provides no protection for habitat. In Kansas, actions that are funded or permitted by the State that may impact the species or its habitat require further review under State law. Kansas has designated critical habitat for the Arkansas darter, which prompts review and permitting of projects proposed within the designated habitat, and allows for review of projects outside the designated habitat as well. This law does provide many conservation benefits for the species, however it does not address private actions on private lands (except direct take), such as winter cattle feeding operations or the drilling of private irrigation wells.

Nearly all Arkansas darter habitat across its range is located on private lands. Many general land uses (i.e., cropping, grazing, groundwater withdrawal) exist that can impact habitat, and most are outside the purview of any existing regulatory mechanisms.

E. Other natural or manmade factors affecting its continued existence:

Threats to the Arkansas darter from population fragmentation and drought primarily result from its present discontinuous distribution. The species is now essentially isolated in a minimum of 12 populations or

population clusters within certain watershed boundaries. This isolation results mainly from anthropogenic changes to the landscape (i.e., dams, long reaches of dewatered stream channels, etc.). As future periodic droughts occur, in combination with the landscape changes, isolated spring-fed habitats are more likely to dry, eliminating localized populations. This threat, in combination with others, is the likely cause of many or most of the extirpations that have previously occurred to this species.

Our analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we believe periods of protracted drought, or drought related to climate change could exacerbate impacts to the Arkansas darter, particularly through its southwestern and western range, by further drying and dewatering of streams. Since the species now mainly occurs in small, isolated areas in much of its range, the intensity and overall threat of isolation and protracted drought to the Arkansas darter is considered moderate to high.

Conservation Measures Planned or Implemented :

In portions of the middle Arkansas River basin in Kansas, several Federal and state programs are attempting to abate or mitigate declines in groundwater levels and stream flows. The Natural Resources Conservation Service is retiring irrigated crop acres through the Conservation Reserve Enhancement Program. Similarly, the State Division of Water Resources requires water offsets for new depletions in over-appropriated groundwater management areas (Kansas Department of Agriculture 2009, pp. 1). Most of these programs focus on the Great Bend Prairie Aquifer, affecting the Rattlesnake, and portions of the Ninnescah, Medicine Lodge, and eastern Cimarron basins; and the High Plains/Ogallala Aquifer, affecting the western Cimarron basin.

The Kansas Partners for Fish and Wildlife Program has completed and signed three private landowner agreements in south central Kansas, which provide for habitat protection and enhancement for a relatively small amount (14 stream miles) of Arkansas darter habitat. The KDWP and CDOW have completed state recovery plans, and are in early stages of implementation. The Arkansas Ecological Services Field Office is currently implementing a Candidate Conservation Agreement with Assurances with the City of Fayetteville to protect 1 of the State’s 15 Arkansas darter localities during development of a business technology park.

The Arkansas Game and Fish Commission is currently working on a genetic analysis project, and a project to remediate severe erosion threatening the largest population in the State (Wagner 2010, pers. comm.). The Service coordinated with CDOW to transplant the species into various sites within its historical range, and species monitoring is ongoing. Additionally, CDOW’s native fishes hatchery is continuing to produce approximately 3,000 Arkansas darters annually, for use as broodstock and transplantation (Nessler 2010, pers. comm.). The CDOW also has an initiative to assist private landowners in conserving habitat.

Summary of Threats :

The Arkansas darter is subject to varying impacts and threats in different portions of its range, and different impacts and threats vary in their immediacy and intensity (see Tables 2 and 3 below). Populations are impacted by decreased water quantity in western portions of its range, including the Cimarron basin of northwestern Oklahoma and southwestern Kansas; Arkansas River tributaries in eastern Colorado; and the

upstream portion of the Rattlesnake Creek basin. Stream dewatering and decreased flows have occurred due to groundwater pumping in some of these areas. In this portion of the species' range the intensity and overall threat level are considered moderate to high. In the remainder of the middle Arkansas drainage (Chikaskia, Ninnescah, Salt Fork Arkansas, Medicine Lodge, and eastern Cimarron basins), the possibility of future expanded irrigation for agricultural production and increased ethanol processing could increase water quantity impacts. Here, the intensity and overall threat is believed low to moderate, but could increase if higher levels of pumping occur. Precipitation patterns and drought cycles also exacerbate the threat of decreased flows and dewatering.

Water quality degradation also impacts the species in portions of its range. Water quality degradation occurs from a variety of sources, including: chemical and sediment runoff from urban, rural, and agricultural sources; localized intensive livestock grazing and small feeding operations; application of animal wastes as fertilizer to cropland; salt water intrusion into groundwater due to heavy exploitation; and infrequent accidental spills from large CAFOs. However, these threats are believed to occur mainly on a localized level resulting in low to moderate intensity and overall threat.

Urban/suburban development and its associated impacts are a significant and immediate threat to the northwestern Arkansas populations and are likely to increase in significance in the southwestern Missouri and northeastern Oklahoma areas. However, threats from urban/suburban development and road and bridge construction are considered low in intensity and overall threat to populations in the middle and upper Arkansas basins.

Invasions by exotic plants that can alter Arkansas darter habitat and water quantity (primary salt cedar – *Tamarisk spp*.) occur in varying densities throughout the middle and upper Arkansas basins. This threat generally increases from east to west, as precipitation levels and their resulting scouring flows decrease. Throughout these areas, threat levels are considered moderate to high in both intensity and overall threat. The species' habitat in the Neosho basin areas is not presently threatened by salt cedar invasion.

Threats to the Arkansas darter from population fragmentation and drought primarily result from its present discontinuous distribution. This isolation results mainly from anthropogenic changes to the landscape (i.e., dams, long reaches of dewatered stream channels, etc.). As future periodic droughts occur, in combination with the landscape changes and other threats, isolated spring-fed habitats are more likely to dry, eliminating localized populations. Since the species now mainly occurs in small, isolated areas in much of its range, the intensity and overall threat of isolation and protracted drought to the Arkansas darter is considered moderate to high. Climate change may exacerbate this threat by increasing the intensity and scale of spring and stream dewatering.

The status of the Arkansas darter varies across its current range. The most typical variant in assessing the status is the immediacy of the threat. Recent information for some populations indicates some stability in abundance and range. In Colorado, populations are known to disperse downstream seasonally with higher flows, but only show signs of stability in a limited number of isolated spring-fed habitats (CDOW 2007). The species continues to be generally abundant and widely distributed in the middle Arkansas River drainages in Kansas, including much of the Chikaskia, North Fork Ninnescah, South Fork Ninnescah, and Medicine Lodge River basins, and the eastern tributaries to the Cimarron River (Tabor 2005, 2006) despite ongoing threats. In southwestern Missouri, the species continues to persist in most known localities (Combes and Winston 2003, pp. 5–11); however, some ongoing and future threats have been identified. The northeastern Oklahoma (Neosho basin) populations are still extant; however, a thorough survey is needed to document their status. Overall, the species still occupies all major watershed units where it was present at the time it was originally designated a candidate species in 1991. However, there has been some range contraction identified in the Chikaskia and Medicine Lodge basins.

Populations within three watershed units have shown recent declines and/or elevated levels of threat. In the western portion of the Cimarron basin in northwestern Oklahoma and southwestern Kansas, several

tributaries have dried and lost isolated occurrences of the Arkansas darter. This contraction of range within the Cimarron basin is expected to continue. In the Rattlesnake Creek watershed in central Kansas, the last identified collection of the species was in 1997; however, additional sampling is needed. In the Illinois River watershed in northwestern Arkansas, several robust populations continue to exist. However, urban/suburban development is rapidly occurring that could severely impact the species in this watershed.

The Arkansas darter is now generally subject to low to moderate intensities of threat throughout most of its range, and these threats are ongoing. However the most serious threat, groundwater depletion and the associated drying of springs and streams, is mainly only occurring on the western and southwestern periphery of its present range. By examining the collection data and information on the species range collected over the past 25 years, the periphery of the species contraction is slowly moving west to east, particularly in the plains of Kansas and northwestern Oklahoma. If protracted drought potentially associated with climate change occurs, and groundwater pumping at high levels for agricultural irrigation continues, dewatering of springs and streams are likely to expand at an increased pace eastward into the areas of south-central Kansas that hold more robust populations of the species. If this occurs, the intensities of threat to the Arkansas darter in these areas could increase significantly.

TABLE 2. Five Listing Factors Threats Assessment Summary Table: Central Arkansas River Basin

	RATTLESNAKE CREEK & NORTH ARK BASIN TRIBS (Kansas)			CHIKASKIA & NINNESCAH BASINS (Kansas)			MEDICINE LODGE & SALT FORK BASINS (Kansas)			CIMARRON BASIN (Kansas & Oklahoma)		
FACTORS	**Immed**	**Intens**	**Overall Threat**	**Immed**	**Intens**	**Overall Threat**	**Immed**	**Intens**	**Overall Threat**	**Immed**	**Intens**	**Overall Threat**
FACTOR A												
Rowcrop Agriculture – Sediment/Water Quality	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low	Low	Ongoing	Low	Low
Riparian Livestock Grazing – Water Quality	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
Confined Animal Feeding Operations	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod
Groundwater Withdrawal - Stream Dewatering	Ongoing	Mod-High	Mod-High	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod-High	Mod-High
Surfacewater Withdrawal - Stream Dewatering	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Mod	Mod
Urban/Suburban Development	n/a	n/a	n/a	Ongoing	Low	Low	n/a	n/a	n/a	n/a	n/a	n/a
Salt Cedar Invasion – Habitat Changes	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High
Road & Bridge Construct - Channelization	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
Dam Construction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Future	High	Low
FACTOR B												
FACTOR C												
Disease and Parasites	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known
Predation	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
FACTOR D												
No Federal Nexus/ Regulatory Changes	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
FACTOR E												
Population Fragmentation/Drought	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod-High	Mod-High
Climate Change	Future	Not Known	Not Known	Future	Not Known	Not Known	Future	Not Know	Not Known	Future	Not Known	Not Known

*Immediacy:
1. Future (future effects anticipated)
2. Ongoing (effects imminent)
3. Historic (effects realized, but restorative action necessary)

**Intensity (strength of stressor):
1. Low
2. Moderate
3. High

Overall Threat Level:
1. Low (no action needed at this time)
2. Moderate (action is needed)
3. High (immediate action needed)
4. Severe (action essential for survival of species)

TABLE 3. Five Listing Factors Threats Assessment Summary Table: Western Arkansas River Basin & Neosho Basin

FACTORS	WESTERN ARK RIVER BASIN (Colorado)			SPRING RIVER BASIN TRIBS (Missouri)			ILLINOIS RIVER BASIN TRIBS (Arkansas)			NEOSHO RIVER BASIN TRIBS (Oklahoma)		
	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat
FACTOR A												
Rowcrop Agriculture – Sediment/Water Quality	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
Riparian Livestock Grazing – Water Quality	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low-Mod	Low-Mod
Confined Animal Feeding Operations	Ongoing	Low	Low	Ongoing	Mod	Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Mod	Mod
Groundwater Withdrawal - Stream Dewatering	Ongoing	Mod-High	Mod-High	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod
Surfacewater Withdrawal - Stream Dewatering	Not Known	Not Known	Not Known	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
Urban/Suburban Development	Ongoing	Low	Low	Ongoing	Mod	Mod	Ongoing	High	High	Ongoing	Mod	Mod
Salt Cedar Invasion – Habitat Changes	Ongoing	Mod-High	Mod-High	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Road & Bridge Construct - Channelization	Ongoing	Low	Low	Ongoing	Low-Mod	Low-Mod	Ongoing	Mod	Mod	Ongoing	Low-Mod	Low-Mod
Dam Construction	n/a	n/a	n/a	Ongoing	Low	Low	Ongoing	Low	Low	Historic	Low	Low
FACTOR B												
FACTOR C												
Disease & Parasites	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known
Predation	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Low	Low
FACTOR D												
No Federal Nexus/ Regulatory Changes	Ongoing	Low	Low	Ongoing	Low	Low	Ongoing	Mod	Mod	Ongoing	Low	Low
FACTOR E												
Population Fragmentation/Drought	Ongoing	Mod-High	Mod-High	Ongoing	Mod	Mod	Ongoing	Mod-High	Mod-High	Ongoing	Mod	Mod
Climate Change	Future	Not Known	Not Known	Future	Not Known	Not Known	Future	Not Know	Not Known	Future	Not Known	Not Known

*Immediacy:
1. Future (future effects anticipated)
2. Ongoing (effects imminent)
3. Historic (effects realized, but restorative action necessary)

**Intensity (strength of stressor):
1. Low
2. Moderate
3. High

Overall Threat Level:
1. Low (no action needed at this time)
2. Moderate (action is needed)
3. High (immediate action needed)
4. Severe (action essential for survival of species)

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

• Implement a range-wide, standardized survey for the species to determine population distribution and trends over a set period of time.
• Establish an Arkansas darter working group with species experts from across its range to identify and draft conservation measures.
• Partner/participate with established Groundwater Districts and state water resource agencies.
• Assist in implementing salt cedar control programs.
• Utilize state and Federal private land conservation programs to provide incentive for relocation or altering small feeding operations.
• Assist state agencies in identifying and alleviating problems associated with CAFO waste, particularly poultry manure.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-imminent	Monotypic genus	10
		Species	**11**
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

The magnitude of threats facing this species is “moderate to low,” for the species overall, given the number of different locations where the species occurs and the fact that no single threat or combination of threats is working to affect more than a portion of the wide spread population occurrences. However, there are populations presently affected by high magnitude threats.

Imminence :

The threats as described for this species are mostly ongoing and low to moderate in magnitude in a large portion of its range. However, in portions of the range, some populations are subject to imminent threats and are in decline due to the impacts of these threats. It is also likely that these imminent threats (mainly groundwater availability to springs and streams) will continue to move to the east, affecting populations that at present still have viable sources of groundwater assuring streamflow. However, since these declines are localized and not range-wide, we consider the threats to the species as a whole to be non-imminent due to their lower general intensities.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

The Arkansas darter has low to medium magnitude of threat; and a non-imminent immediacy, therefore it was not considered for emergency listing.

Description of Monitoring:

Minimal sampling of Arkansas darter populations occurred in Oklahoma and Missouri in 2011. In the Illinois River drainage in Arkansas, a complete survey of the species’ two county range was completed. In Kansas,

one watershed with the species was sampled in 2011 by KDWP's stream monitoring program. In Colorado, CDOW completed a range-wide survey in 2010 and collected genetic material for analysis.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Arkansas,Colorado,Kansas,Missouri,Oklahoma

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

All states in the range of the Arkansas darter provided information for this review.

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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: _____ 05/31/2012
Date

Concur: _____ 11/06/2012
Date

Did not concur: _____ _____
Date

Director's Remarks: